NOVEMBER DECEMBER 1999

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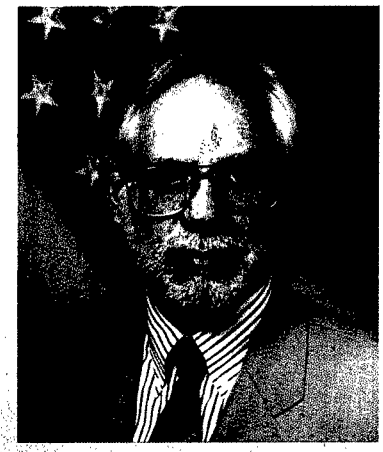
PROGRAM MANAGER

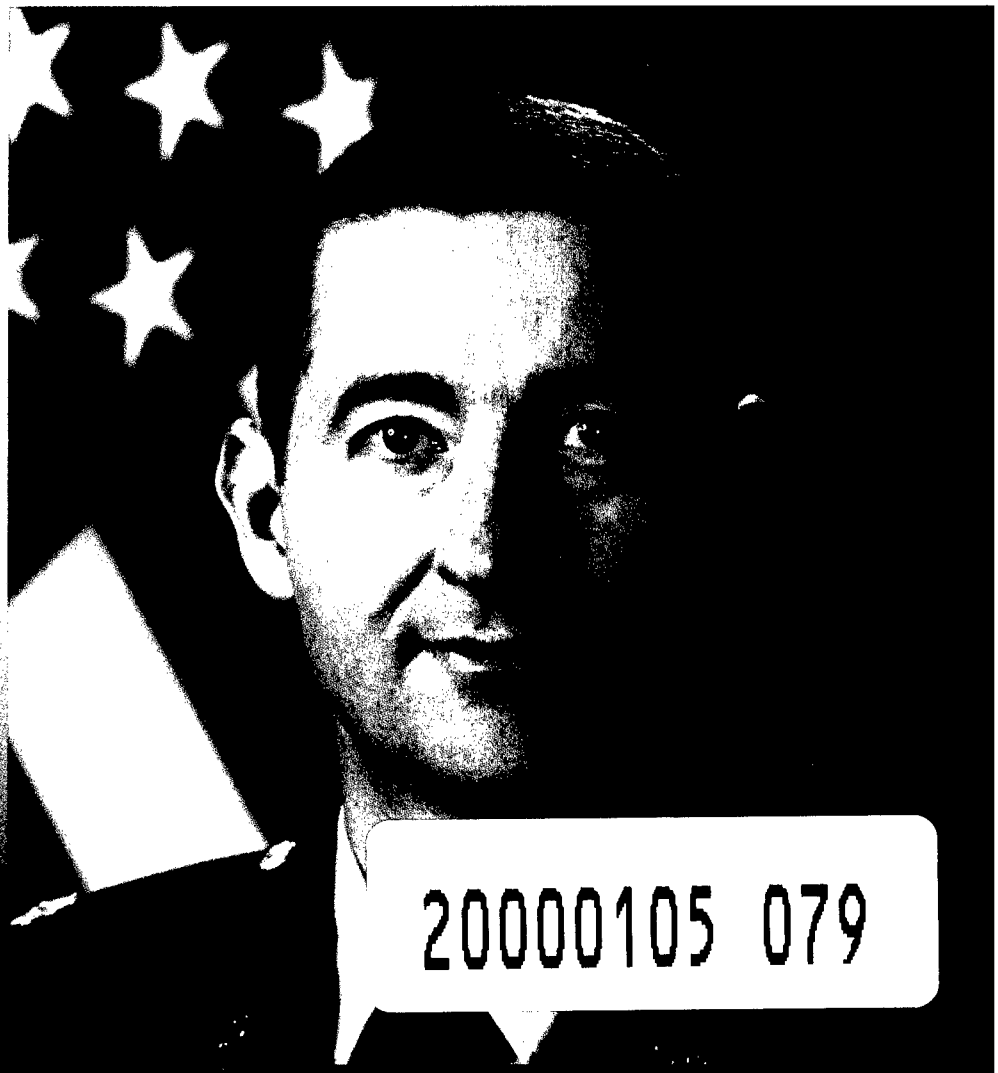
ABERDEEN REVERSES OUTSOURCING DECISION

Major Range & Test Facilities Focus of Annual Review

Giving the Warfighter an Opportunity to Operate Systems Being Tested Under Realistic Conditions



Philip E. Coyle III
Director, Operational Test & Evaluation, Office of the Secretary of Defense



ALSO IN THIS ISSUE:

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Lt. Col. George Schneller, U.S. Army
Product Manager, Medium Tactical Wheeled Vehicle (REMAN) Program

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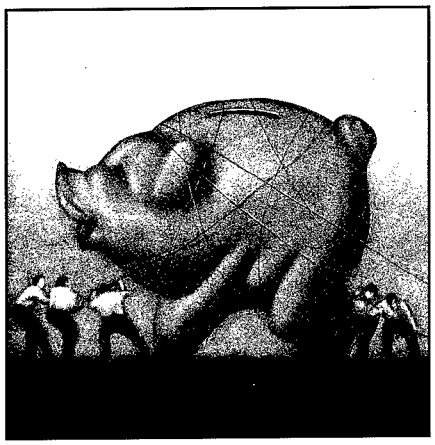

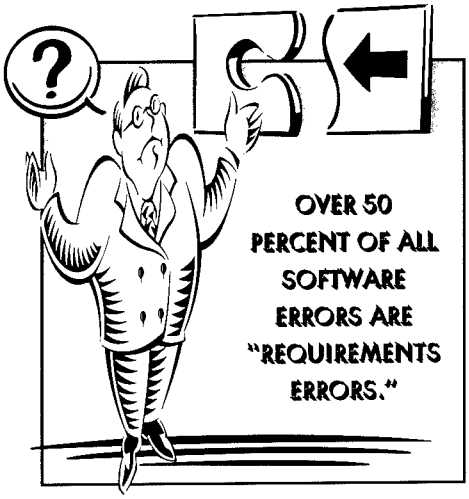

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Remanufacturing vs. New Procurement

A Proven, Cost-Effective Strategy to Interject Technology Upgrades, Reduce Acquisition Costs for New Equipment

SUSAN A. BROWN

As military budgets decline and equipment continues to age, DoD must find ways to get the most out of taxpayers' dollars. Remanufacturing is a proven method to interject technology upgrades and reduce acquisition costs for new equipment.

Aging Vehicle Fleet

The U.S. Army has an acute aging situation in some of its tactical wheeled vehicle fleets due to insufficient funding. Tactical wheeled vehicle funding decreased over the years, with the most critical funding shortages occurring in 1996 and 1998. If DoD delays or halts modernization, aging of the tactical wheeled vehicle fleet will continue to cause the escalation of operation and support costs and the reduction of readiness rates.By 2002, 38 percent of the Army's vehicle fleet will exceed its economic useful life, and 60 percent will be overage by 2010.

The 2½-ton, 5-ton, and Heavy Equipment Transporter (HET) system fleets are in the worst condition. Generally, the economic useful life of these vehicles is 20 years for the 2½-ton, 22 years for the 5-ton, and 14 years for the HET. And the average vehicle age for the 2½-ton truck is 25.7 years, the 5-ton is 15.6 years, and 13.1 years for the HET system.[1]

***Brown** is a program analyst for the U.S. Marine Corps PM-Medium Tactical Vehicle Replacement (MTVR) program. She holds a master's degree in Public Administration from Central Michigan University and is a Certified Level III acquisition professional in Program Management; and Business, Cost Estimating, and Financial Management. She is a graduate of APMC 98-2, DSMC.*

Modernization — A Costly Endeavor

In 1993, the Army analyzed its entire tactical wheeled vehicle fleet situation to determine the investment required to keep the fleet modern. As a result of this analysis, the Under Secretary of Defense (Acquisition & Technology) completed a Report to Congress on Tactical Wheeled Vehicle Investment Strategy.[2] According to the report, the funding necessary to adequately modernize the light, medium, and heavy fleets over the next 10-15 years is $600-$800 million per year. This level of tactical wheeled vehicle funding would stabilize fleet ages within economic useful lives.[3] However, this rate of spending is currently unaffordable for the Army, in light of reductions planned in the Army's research, development, and acquisition budgets.

Yes, There's a Plan

The Army's solution to this critical situation, as outlined in the Tactical Wheeled Vehicle Investment Strategy, is a combi-

2½-TON REMANUFACTURED VEHICLE

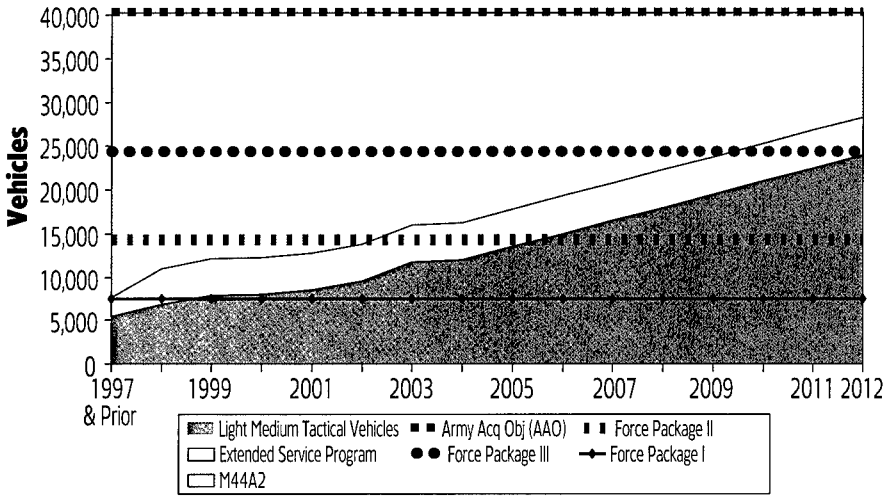
Photo courtesy U.S. Army Aberdeen Test Center

nation of new procurement and remanufacturing of existing vehicles.

The attempt to use a remanufacturing approach to fleet modernization is not a new concept. This approach has been used quite successfully for armor and aircraft systems. Historically, the Army has designed, built, and tested prototype trucks, incorporating variances from other trucks, calling the final result a product improvement. During the 1970s, these early attempts at remanufacturing trucks proved to be too costly; therefore, this method of building trucks never moved into the production phase.

The Army's Family of Medium Tactical Vehicles (FMTV) acquisition plan projects that the 2½-ton and 5-ton fleet requirements will be filled with FMTVs by 2022. Under this strategy, approximately 10,000 FMTVs will be beyond their economic useful life by the time all of the older M44- and M939-series trucks are replaced with FMTVs (Figure 1).

FIGURE 1. **No Additional 2½-Ton ESP Production After 1999**



Remanufacturing Program

In 1996, the Army established its Medium Tactical Wheeled Vehicle (REMAN) program, led by product manager, Army Lt. Col. George R. Schneller. He and the Remanufacture Program Team were charged with managing two medium truck programs – the 5-ton Tactical Truck Remanufacture Program and the 2½-ton Extended Service Program. These programs provided a cost-effective means to assure an adequate inventory of modern medium tactical trucks by remanufacturing a portion of the existing 2½-ton and 5-ton fleets in a "total force" framework, in conjunction with brand new trucks provided through the FMTV procurement.

"The 2½-ton Extended Service Program proved that remanufacturing of older trucks on a large scale is a cost-effective strategy to provide modernized vehicles to the force until new trucks can be procured and fielded."

–Army Lt. Col George Schneller
Product Manager, Medium Tactical Wheeled Vehicle (REMAN) Program

The remanufactured vehicles meet current emission standards and include numerous safety improvements. Moreover, the vehicles are equipped with a new engine; a central tire inflation system and super single radial tires for enhanced mobilit; automatic transmission; power/power assist steering; and an antilock brake system (ABS) for the 5-ton. ABS was under development as an upgrade to future production models of the 2½-ton. The remanufacture programs allow the total Army (Active, Reserve, and National Guard) to enhance readiness and reduce cost in a time of declining defense spending.

Since the Army does not have an adequate number of medium tactical wheeled vehicles available to proceed solely with remanufacture without seriously impacting unit readiness, new production is necessary to free old assets while maintaining an acceptable state of readiness. The Army Tactical Wheeled Vehicle Investment Strategy calls for the

LT. COL. GEORGE SCHNELLER, U.S. ARMY

Product Manager, Medium Tactical Wheeled Vehicle (REMAN) Program

U.S. Army Tank-automotive and Armaments Command

Lt. Col. George Schneller, U.S. Army, received his commission as a second lieutenant, Ordnance Corps, in May 1978 from Arkansas Tech University. His initial assignment was with the 3rd Infantry Division at Schweinfurt, West Germany, where he served in a variety of maintenance platoon and staff positions, culminating in the command of a forward support maintenance company. Upon completion of the Ordnance Officer Advanced Course, he was reassigned to Germany as the fielding Officer for the Tactical Wheeled Vehicle Fielding Team, Europe.

Upon returning to the United States, Schneller was assigned as the maintenance officer to the 94th U.S. Army Reserve Command, headquartered at Hanscom AFB, Mass. From there, he participated in the Training with Industry program at Deere and Company in Moline, Ill.

Assigned to the Program Office, Tactical Wheeled Vehicles in 1990, he served as the Fielding Officer, Assistant Project Officer on several Heavy Truck programs, and Executive Officer to the Program Executive Officer. After graduation from the Defense Systems Management College (PMC 95-1), he served on the staff of the Assistant Secretary of the Army for Research, Development and Acquisition. Since September 1996, he has been assigned as the Product Manager for the Medium Tactical Wheeled Vehicle Remanufacture Program with Program Executive Office, Ground Combat and Support Systems.

remanufactured vehicle to be fielded concurrently with the new 2½-ton, Light Medium Tactical Vehicle (LMTV).

Extended Service Program

Under congressional direction, the Army initiated its 2½-ton Extended Service Program in 1991. Congress set two program objectives for the Extended Service Program: produce a vehicle with 80 percent of the service life of a new vehicle and at 50 percent of the cost.[4]

The Extended Service Program remanufactures older M44A2-series 2½-ton trucks into a new M44A3 configuration. The remanufacture process starts with the shipment of older vehicles from the field to the contractor's facility. Vehicles inducted into the program are excess field turn-ins and displacements from new and remanufactured fielding. Once received, the vehicles are completely torn apart and disassembled. Parts not reused are disposed of or sold as scrap for funds that can be credited back into the contract. Parts slated to be reused are thoroughly inspected. Those deemed suitable for use are refurbished, repaired, and modified, as required.

For planning purposes, the Remanufacture program team factored in a ratio of three older vehicles to produce two suitable platforms to receive the new or refurbished subsystems. These parts, along with numerous new parts, are used to feed an assembly line.

In May 1992, the government awarded two Extended Service Program prototype development contracts: one to Cummins Military System and one to AM General Corporation (AMG). Each contractor remanufactured eight vehicles that the government tested for performance. Based on test results as well as production proposals, the government then awarded AMG a five-year multiyear production contract in September 1993. The addition of several performance enhancements not originally envisioned (automatic transmission and central tire inflation system) increased the cost of the remanufactured vehicle to about 60 percent of the cost of a new vehicle. However, this cost was offset by the value of increased mobility enhancements.

Overall, the remanufactured vehicle (M44A3) met 95 percent of the performance requirements at 60 percent of the cost of a new FMTV. The service life of the remanufactured vehicle is now projected to be equal to that of a new truck.

According to Schneller, "The 2½-ton Extended Service Program proved that remanufacturing of older trucks on a large scale is a cost-effective strategy to provide modernized vehicles to the force until new trucks can be procured and fielded."

Cancellation Due to Insufficient Funds

The 5-ton Tactical Truck Remanufacture vehicle program began in November 1996 under the Medium Tactical Truck Remanufacture (MTTR) program. Two contractors, Oshkosh Truck Corporation and AMG, each built five prototype trucks using portions of the basic model M939 trucks along with technology insertion. Together, the two contractors completed prototype testing of these vehicles in about half the allotted time, with a reliability rate three times the requirement. Regrettably, the Army cancelled the 5-ton Tactical Truck Remanufacturing effort at the end of its research and development phase in June 1998, due to insufficient funding for the medium truck program.[5]

In 1998, after producing 5,483 vehicles (M44A3), the Army discontinued remanufacturing due to lack of funds. However, the program did accomplish the goals established by the Army's Tactical Wheeled Vehicle Investment Strategy. Clearly, M44A3 remanufacturing is a viable alternative to procurement of new equipment.

To some, cancellation of the two programs may appear arbitrary; however, it is important to recognize and understand that the Army modernizes its vehicle fleet according to a four-level Force Package structure. Force Package I units maintain the highest readiness rate. The standard modernization approach is to

focus on Force Package I units first and to finish with Force Package IV units. This approach is a requirement-based allocation of equipment that is priority-driven and constrained by resources.

Force Package I

Using the Tactical Wheeled Vehicle Investment Strategy as guidance, units designated Force Package I are combat-ready units and are equipped with the newest most technologically advanced trucks. A mix of remanufactured vehicles and new vehicles (FMTV) fills this requirement as long as all vehicles are within their economic useful life.

Force Package II

Force Package II units contain remanufactured vehicles with technological insertion. They may also contain new technologically advanced vehicles if funds permit.

Force Package III

Force Package III units receive cascaded equipment from higher Force Packages. Cascaded equipment is displaced equipment fielded as a redistribution of an existing Army capability previously fielded from one organization to another. These units could receive remanufactured vehicles with technological insertion or new technologically advanced vehicles, if funds permit.

Force Package IV

Force Package IV units are equipped with vehicles cascaded from other Force Packages that are usually overhauled and rebuilt vehicles. If funds permit, IV units may also receive remanufactured vehicles with technology insertion or new technologically advanced vehicles.

During the 2½-ton remanufacture effort, new LMTVs were being fielded into Force Package I units, and remanufactured trucks were being used to modernize Force Package II through IV units, which include the Army National Guard and Reserve. Presently, the average age of the Army National Guard's 2½-ton fleet is 26 years, long past the economic useful life of the vehicle. Continuation of remanufacture programs would allow Force Package III and IV units to begin fleet modernization earlier.

By combining new production with remanufacture, the Army could modernize the 2½-ton fleet five to 10 years sooner than buying all new vehicles. This would also set a precedent to begin planning a remanufacture program for the FMTV (Figure 2).

Bottom Line — Modernized Vehicles to the Force

The aspect of remanufacturing has significant implications in the future of tactical wheeled vehicles. The 2½-ton Extended Service Program proved that remanufacturing of older trucks on a large scale is a cost-effective strategy to provide modernized vehicles to the force until new trucks can be procured and fielded.

Recently, the Army began a remanufacture program for the Heavy Expanded Mobile Tactical Truck (HEMTT) with Oshkosh Truck Corporation, and is also investigating a remanufacture program for the High Mobility Multi-purpose Wheeled Vehicle (HMMWV).

"With the escalating cost of new trucks," said Schneller, "the challenge is to develop business plans and investment strategies to support a balance of remanufacture and new production, thus maximizing the number of modern vehicles supporting our armed forces today and into the future."

Editor's Note: Schneller retired from active duty Oct. 1, 1999. Currently, he is the Senior Program Manager, Government Division for Technology Ventures, Inc. Schneller encourages questions or comments about the program. Contact him at **gSchneller@technologyventures.net.** The Medium Tactical Wheeled Vehicle (REMAN) Program Office, which also manages the U.S. Marine Corps Medium Tactical Vehicle Replacement (MTVR) program, is now led by Product Manager, Army Lt. Col. Walter R. Raymond Jr. The author also encourages questions or comments on this article. Contact her at **BrownS@tacom.army.mil.**

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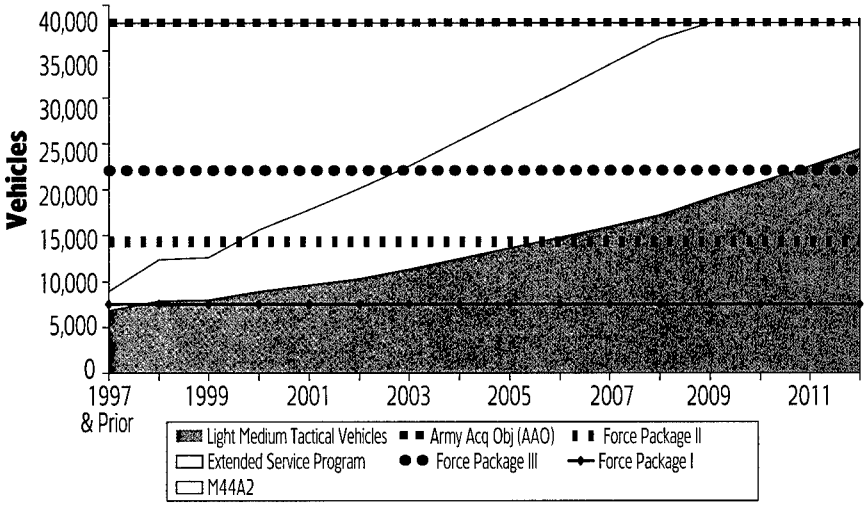
FIGURE 2. **2½-Ton Fleet Composition, 2½-Ton Extended Service Program, and Light Medium Tactical Vehicle Production**



U.S. ARMY PUBLIC AFFAIRS NEWS RELEASE

Improved Army Truck Gets OK for Production

GERRY J. GILMORE

WASHINGTON (Army News Service) – The Army has authorized production of an improved version of a tactical truck that was initially fielded to soldiers almost three years ago.

Army Acquisition Executive Paul J. Hoeper gave the Family of Medium Tactical Vehicle truck contractor, Stewart and Stevenson Inc., the go-ahead Sept. 9 to produce an A1, or modified version of the truck, after prototypes successfully completed more than 90,000 miles of extensive testing at Aberdeen Proving Ground, Md.

The improved truck, which like the original model comes in two-and-a-half-ton (M1078A1) and five-ton (M1083A1) variants, features a more powerful diesel engine, a better transmission and brakes, added corrosion protection, computerized engine diagnostics, and beefier drive line engine/transmission/differential connection) components, according to Army officials. The A1 also has almost 40 additional upgrades, such as more durable seating material and cargo tarp, beefier door hinges, and reinforced sections that can be used as footholds to gain access to the cargo area.

"We're going to produce and field a truck with eight times the reliability, availability, and maintainability of the old 'deuce-and-a-half' truck it replaces," said Hoeper during a Sept. 9 press luncheon at the Pentagon. "We've got a truck we're proud to be buying for soldiers, and I think the contractor is proud to be making it for soldiers."

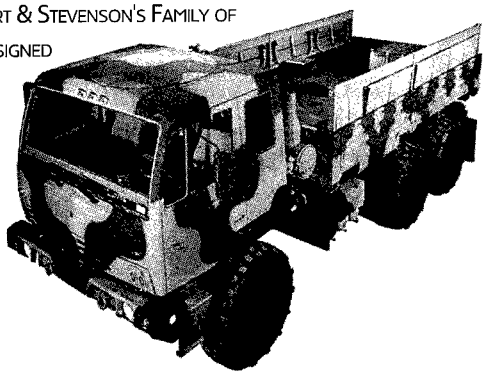
More than 7,600 original-model (AO) FMTV trucks were produced and delivered to units Army-wide since January 1996 as part of a $1.4 billion, five-year contract with the Houston-headquartered contractor, according to officials.

The Army needs 85,000 new trucks to replace its aging fleet, said officials. The new Light Medium Tactical Vehicle (two-and-a-half-ton cargo and van models) and Medium Tactical Vehicle (five-ton cargo, tractor, van, wrecker, tanker, and dump trucks) were designed to replace 30-year-old two-and-a-half-ton (deuce-and-a-half) and five-ton vehicles.

Army officials describe the FMTV program as "revolutionary." While older trucks were mostly custom-designed and engineered to meet military specifications and performance standards unmet by commercial vehicles under acquisition regulations at the time, recent acquisition-rule reform has enabled the Army to use more "off-the-shelf" components and commercial technology for its new trucks.

FMTVs are manufactured according to military performance specifications, but the contractor selects and assembles the commercial-source components, according to Army officials. This more efficient process enables the Army to purchase more trucks at less cost to taxpayers. FMTV trucks have also been engineered to make them easier to airlift during deployments, with some models specifically designed for airdrop.

Officials note that FMTVs have proven to be one of the Army's most durable pieces of equipment, with a 97 percent operational readiness rate. However, the



AN FMTV TRUCK FROM STEWART & STEVENSON'S FAMILY OF MEDIUM TACTICAL VEHICLES, DESIGNED FOR STATE-OF-THE-ART DURABILITY, RELIABILITY, AND TOTAL MISSION CAPABILITY. ALL TRUCK COMPONENTS, FROM THE ENGINE TO THE DRIVE TRAIN, CHASSIS, CAB, AND BODY ARE DESIGNED TO WITHSTAND THE TOUGHEST MILITARY ASSIGNMENTS.
Photo courtesy Stewart & Stevenson

first batch of FMTVs had some "bugs" that needed to be worked out. Last year, the Army sent out a March 10 message, restricting the speed of original-model two-and-a-half-ton FMTVs to 30 mph after three non-fatal accidents involving those models were reported in close succession. That message was later expanded to include five-ton FMTVs.

A total of 11 accidents – all involving no injury or minor injury and involving original-model FMTV trucks – have been reported since fielding, said Army officials.

Army and contractor officials found that the initial model's drive line was susceptible to vertical flexing and vibration when the vehicle was lightly loaded and driven above 50 mph on paved highways for long distances. Resultant vibration-induced stress on U-joints connecting the transmission to the drive shaft caused the drive shaft to break off in three accidents cited, officials said.

Original-model FMTV trucks are now being retrofitted in the field with sturdier U-joints, larger-diameter drive shafts, and a stronger flywheel housing, said Army officials. Retrofits have been completed on trucks in Korea, and Fort Carson, Colo., and the job is 25-percent complete involving a total of 500 vehicles in Hawaii. Work to retrofit 2,600 trucks at Fort Bragg, N.C., [started] in October.

Other FMTV retrofit operations are scheduled at Fort Stewart, Ga.; Fort Benning, Ga.; Fort Campbell, Ky.; Fort Drum, N.Y.; Fort Huachuca, Ariz.; Fort Hood, Texas; and Fort Lewis, Wash.

"The approach we've taken is much like that of recall [campaigns] of commercial [auto] manufacturers," said Lt. Gen. Paul J. Kern, the military deputy to the Assistant Secretary of the Army for Research and Development.

The new A1 truck features the drive line improvements and other upgrades such as better brakes, a smoother, seven-speed automatic transmission, increased engine size and horsepower, and more, said Kern.

Many FMTV improvements were made according to input from soldiers in the field, said Chief Warrant Officer Christopher Mitchell, a support maintenance officer with U.S. Army Special Operations Command at Fort Bragg. Mitchell, who is Ranger-qualified, was asked to travel to Aberdeen to suggest improvements for the FMTV. Outside the Pentagon after the luncheon, press members were able to inspect a partially upgraded FMTV fresh from testing at Aberdeen with 25,000 miles on its odometer.

Mitchell helped to explain the vehicle to the press. Later, he climbed up into the cab and sat behind the wheel.

"I came up here to tell people about some of the [FMTV] problems which needed to be fixed," said Mitchell. "The modifications, without a doubt, have gone a long way to improve the vehicle."

FMTV Program Manager Col. Robert B. Lees was also on hand to explain the improved truck to the press. Soldiers should start receiving the A1 in March [2000], he said.

Between now and July [2000], said officials, Stewart and Stevenson will produce more than 1,500 A1s – at a cost between $130,000-$320,000 a copy, depending upon the type of truck and configuration — at its Sealy, Texas, plant.

"We addressed the users' issues over the past two months, and [improvements] will be manufactured-in at the plant," said Lees. One of Mitchell's suggestions – a reinforced rear tail light assembly that can be used by soldiers as a foothold to climb up into the cargo area at the rear of the truck – will be implemented.

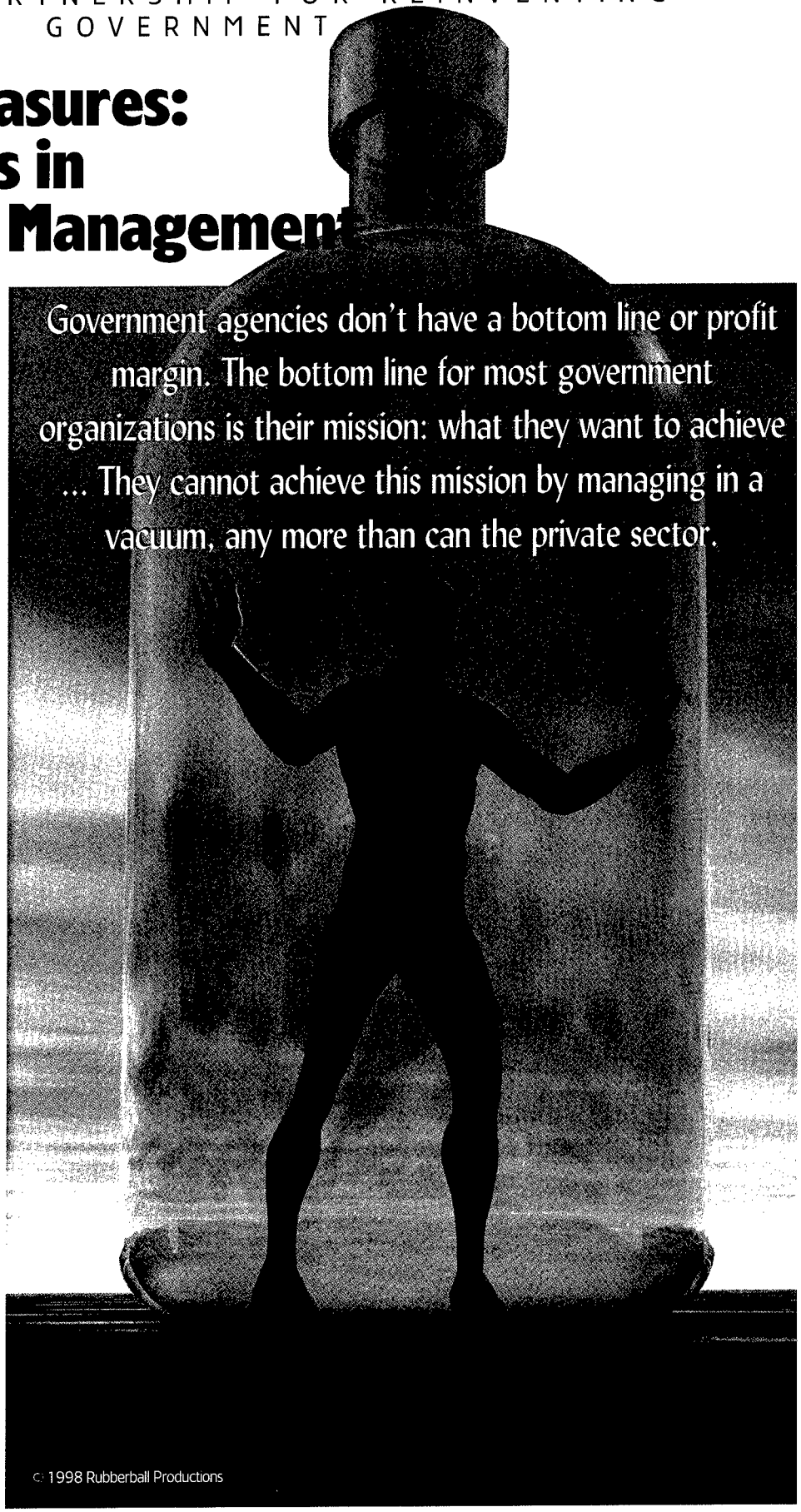
"It doesn't affect critical mission performance, but it affects soldiers' confidence in the vehicle," said Lees. "It is an item that makes the truck more comfortable to soldiers in the field.

"So, we're also out there listening ... as well as evaluating things from a design standpoint."

Editor's Note: This information is in the public domain at **http://www.dtic.mil/armylink/news.**

Balancing Measures: Best Practices in Performance Management

Editor's Note: This Executive Summary presents highlights of *Balancing Measures: Best Practices in Performance Management*, a study solicited by the National Partnership for Reinventing Government and published online August 1999. To read the entire study, go to **http://www.npr.gov/library/papers/bkgrd/balmeasure.html** on the NPR Web site.



A new report, solicited and published by the National Partnership for Reinventing Government (NPR) describes the results of a recent study on how best practices drive change in organizations – balancing customer satisfaction, employee satisfaction, and business results. In February 1999, a core team was formed, which included representatives from federal organizations and local governments as well.

Leaders were selected from among the core team members to head up the study's three cluster teams – the High Impact Agency (HIA) Team, the State and Local Government Team, and the Regulatory Agencies Team. These teams represented the division of responsibility for public sector organizations that the core team wanted to review for best practices.

In addition, the core team agreed to look at the experiences of foreign governments, such as the United Kingdom and Canada. The cluster leaders then formed their respective teams, each of which included individuals from many resource partners located across the nation.

This was not a formal benchmarking study. Rather, its purpose was to seek

out the best practices and lessons learned by public and private sector entities in their performance planning and management. However, while the methodology did not include all the elements of a benchmarking study, the team adopted the Benchmarking Code of Conduct (published by the American Productivity & Quality Center) since it incorporates principles applicable to the study.

GPRA — The Beginning

When the Government Performance and Results Act (GPRA) was first implemented, many felt that government management was somehow "different," that the same rules that applied to the private sector could not apply to the public, or at least not in the same way. After all, government agencies don't have a bottom line or profit margin. But recent efforts, as this study shows again and again, attest that is not true. The bottom line for most government organizations is their mission: what they want to achieve.

But they cannot achieve this mission by managing in a vacuum, any more than can the private sector. More specifically, the roles of customer, stakeholder, and employee in an organization's day-to-day operations are vital to its success — and must be incorporated into that success.

In their groundbreaking *Harvard Business Review* article, Robert S. Kaplan and David P. Norton introduced the concept of the Balanced Scorecard to the private sector. This article, and subsequent works by them, [discuss] private sector efforts to align corporate initiatives with the need to meet customer and shareholder expectations. This study looks at how these efforts relate to, and are being replicated within, the public sector. It examines the ways and means by which government organizations are trying to include customers, stakeholders, and employees in their performance management efforts — to reach some *balance* among the needs and opinions of these groups along with the achievement of [each] organization's stated mission. All of the organizations that served as partners in preparing this report have had some level of success in doing this.

Our partners believe that, while there is no perfect fit of the Balanced Scorecard as envisioned by Kaplan and Norton with performance planning, management, and measurement within the public sector, this does not mean that the concept isn't useful in government planning — particularly with some tinkering and tailoring. So, public sector organizations with the most mature strategic planning processes — notably city and state governments — felt that the area of employee satisfaction, for example, translated better to the public sector when seen as employee empowerment and/or involvement.

Defining who exactly the *customer* is can be a challenge for government agencies, especially for federal agencies with more than one mission. For example, the U.S. Coast Guard has both an enforcement and a Service mission — and consequently different customer bases. And even those agencies that have but a single mission, such as regulatory agencies like the Environmental Protection Agency, must take into account not only those with whom they deal on a day-to-day basis in their enforcement activities, such as major manufacturers, but also the citizen who is being protected by those enforcement activities. And the organization that provides a service or benefit, like the Social Security Administration, must distinguish between what the customer may want and what U.S. citizens may be willing to spend: that is, to balance their fiscal responsibilities to the taxpayer with their responsibilities to beneficiaries.

Other important lessons about balanced performance measurement gleaned from site visits and interviews with our best practice and resource partners include the following:

- Adapt, don't adopt: Make a best practice work for you.
- We aren't so different after all: Public or private, federal, state, or local, there are common problems — and common answers.
- Leadership doesn't stop at the top, but should cascade throughout an organization, creating champions and a team approach to achievement of mission.
- Listen to your customers and stakeholders.
- Listen to your employees and unions.
- Partnership among customers, stakeholders, and employees results in success. Telling — rather than asking — these groups what they need does not work.

Why should you, a government leader, try to achieve a balanced set of performance measures — or what's often referred to as a *family of measures*? Here's what we found in our research: Because you need to know what your customer's expectations are and what your employee needs to have to meet those expectations. Because you cannot achieve your stated objectives without taking those expectations and needs into account. Most importantly, because it *works*, as can be seen from the success of our partners.

So you need to balance your mission with customer, stakeholder, and employee perspectives. How exactly do you go about doing this? These are the best practices we learned from our partners.

Establish a Results-Oriented Set of Measures That Balance Business, Customer, and Employee

- *Define what measures mean the most* to customer, stakeholder, and employee by (1) having them work together, (2) creating an easily recognized body of measures, and (3) clearly identifying measures to address their concerns.
- *Commit to initial change* by (1) using expertise wherever you find it; (2) involving everyone in the process; (3) making the system nonpunitive; (4) bringing in the unions; and (5) providing clear, concise guidance as to the establishment, monitoring, and reporting of measures.
- *Maintain flexibility* by (1) recognizing that performance management is a living process, (2) limiting the number of performance measures, and (3)

maintaining a balance between financial and nonfinancial measures.

Establish Accountability at All Levels of the Organization

- *Lead by example.*
- *Cascade accountability:* share it with the employee by (1) creating a performance-based organization, (2) encouraging sponsorship of measures at all levels, and (3) involving the unions at all levels of performance management.
- *Keep the employee informed* via Intranet and/or Internet; don't rule out alternative forms of communication.
- *Keep the customer informed* via both the Internet and traditional paper reports.
- *Make accountability work:* reward employees for success.

Supplement or replace monetary rewards with nonmonetary means, reallocate discretionary funds, and base rewards in a team approach.

Collect, Use, and Analyze Data

- *Collect feedback data,* which can be obtained from customers by providing easy access to your organization; remember too that "survey" is not a four-letter word.
- *Collect performance data* by (1) investing both the time and the money to make it right, (2) making sure that your performance data mean something to those that use them, (3) recognizing that everything is not online or in one place, and (4) centralizing the data collection function at the highest possible level.
- *Analyze data* by (1) Combining feedback and performance data for a more complete picture, (2) conducting root-cause analyses, and (3) making sure everyone sees the results of analyses.

Connect the Dots

If your performance management efforts are not connected to your business plan (which defines day-to-day operations in a government agency) and to the budget (which is where the money is), then you will be doomed to failure because your performance measurement approach will have no real meaning to the people running, or affected by, the program. Planning documents must connect to business plans, and data systems, and the budget process must be integrated with all these other factors. By doing so, you can create a strategic management framework that serves to focus the entire organization on the same mission and goals.

Share the Leadership Role

Leadership is a critical element marking successful organizations, both public and private. Cascaded throughout an organization, leadership gives the performance management process a depth and sustainability that survives changes at the top—even those driven by elections and changes in political party leadership. Two experts in the field, the Hon. Maurice McTigue, a former New Zealand cabinet member now working at George Mason University, and Dr. Patricia Ingraham of the Maxwell School at Syracuse University, emphasize in their teaching the importance of leadership in a political environment. Given the potential constraints such an environment can present, a successful public sector organization needs strong leadership that supports the adoption of balanced measures as a feature of organizational management and accountability.

NOMINATION CONFIRMED (CIVILIAN)

Sept. 30, 1999

The following civilian Executive Nomination was confirmed by the Senate during the current Congress. (*Nomination subject to the nominee's commitment to respond to requests to appear and testify before any duly constituted committee of the Senate.)

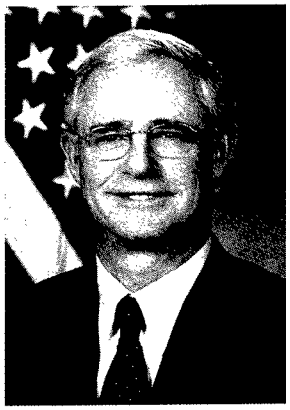
PN283* DEPARTMENT OF DEFENSE
Arthur L. Money, of Virginia, to be an Assistant Secretary of Defense

Editor's Note: Excerpt from Sept. 30, 1999 U.S. Senate Legislative Activities. This information is in the public domain at **http://www.senate.gov/legislative/legis_act_nominations_confirmed_civilian.html.** President Clinton nominated Money May 13 as Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (C3I).

NEW NAME FOR ACQUISITION & TECHNOLOGY

Oct. 5, 1999

The President of the United States has signed into law the FY2000 National Defense Authorization Act. One of the major items affecting A&T is a new title for Dr. Jacques S. Gansler, the current Under Secretary of Defense for Acquisition & Technology. His new title is: Under Secretary of Defense for Aquisition, Technology & Logistics.



U.S. ARMY PUBLIC AFFAIRS NEWS RELEASE

21st Century Adaptive Thinking Focus of Army Experiment 6

Latest Training-Focused Experiment Debuts at AUSA Annual Meeting

The latest in Army training concepts [highlighted] the military exhibits at the 1999 Association of the U.S. Army's Annual Meeting, located at the Marriott Wardman Park Hotel, Washington, D.C., Oct. 11-13.

The Army Experiment Six (AE6) is the latest in a series of Army Experiments originated by then Army Chief of Staff Gen. Gordon Sullivan to prepare the forces for the revolution in technology associated with the 21st century. The U.S. Army's Training and Doctrine Command (TRADOC) again leads this year's effort to present AE6.

"Training the Forces of Army XXI," the AE6 theme, shows unprecedented development in the adaptive thinking that is characteristic of a learning organization. Teaching "how to think" in addition to "what to think," AE6 built on its predecessors, exploring how leaders can be better trained in a digital environment. Last year's AE5 focused on situational awareness in a digital environment.

An interactive "adaptive thinking" mini-theater [allowed] the viewer to experience adaptive thinking in the context of a futuristic scenario. Accompanying it [was] another mini-theater that [presented] the Mission Planning Rehearsal Tool, used by the 10th Mountain Division to prepare for its August deployment to Bosnia. The exhibit [included] an overview video of AE6 and updates on the Army's digitization campaign. Completing the exhibit [was] a video wall that [featured] comments by senior Army, industry, and academia leaders.

Compounding the value of the exhibit [was] the presence at the Annual Meeting of thousands of U.S. Army soldiers from all military specialties, available for insights into their own experiences.

AUSA is a private, nonprofit, professional, educational, national, military association dedicated to maintaining a strong national defense, with special emphasis on the role of the U.S. Army and support for members of the Army. Under 10 United States Code § 2548, the AUSA has been authorized support of the type described in this release. For more information, contact Army Public Affairs, (703) 697-4314.

Editor's Note: This information is in the public domain at **http://www.dtic.mil/armylink/news**.

Army Shows Its Support for Manpower and Personnel Integration

MANPRINT Symposium is Proof Positive

RAYMOND G. BRANDENBURG • ROBERT F. HOLZ

The Manpower and Personnel Integration (MANPRINT) program corrects a potentially fatal flaw in the materiel acquisition process: the lack of attention paid to soldier performance early in system design and development. As the Army continues to face reduced manning levels, the temptation to rely more heavily on technology as a force multiplier is a difficult one to resist. Experience has shown, however, that technology employed in a vacuum is not the solution. Soldiers can be overburdened by high-technology weapon systems, and force effectiveness can suffer as a result.

MANPRINT, which was initiated in 1984, focuses system design and development on soldiers and includes them as an integral part of the system.

MANPRINT emphasizes integration of six domains: manpower, personnel, training, human factors engineering, system safety, and health hazards. Each domain and its influence on soldier performance capabilities are carefully considered during all stages of the acquisition process. After a system has completed the MANPRINT process, users can readily distinguish it from one that has not been given the same consideration. The "MANPRINTed" system now includes the most critical element — *the soldier.*

In 1997, Army executives, including a MANPRINT General Officer Steering Committee (co-chaired by the Assistant Secretary of the Army for Manpower & Reserve Affairs and the Deputy Under Secretary for Operations Research) began assessing the viability and need for the Army's MANPRINT program. After a two-year thorough examination, they determined the MANPRINT program is indeed an essential part of the Army's acquisition strategy, proven to reduce Operations and Sustainment costs for existing and developing systems. Executive policies published currently mandate the application of MANPRINT to all Acquisition Category systems. Additionally, MANPRINT will be embedded in the Operational Requirements Document, addressed in Source Selection, and taught to Program/Project/Product Managers (PM) and leaders.

Although the Army developed and disseminated these policies, did the word really get out to the acquisition community?

If participation and attendance at the MANPRINT Symposium Aug. 18-19 is any indication, the word is out – "loud and clear." This year over 140 attendees, representing a wide array of Army acquisition activities, attended the two-day symposium sponsored by the Personnel Technologies Directorate, Office of the Deputy Chief of Staff for Personnel, HQDA. "Shaping MANPRINT for the Next Millennium" was the theme selected for the 1999 symposium.

Army Maj. Gen. John M. LeMoyne, Assistant Deputy Chief of Staff for Personnel, Department of the Army, gave the welcoming remarks and presented the following MANPRINT Achievement Awards for 1998:

- Richard Brown, Training and Doctrine Command (TRADOC) Program Integration Office for Army Battle Command System (ABCS), Fort Leavenworth, Kan., for his work on Combat Developments.
- Beverly Knapp, Human Research and Engineering Directorate, Aberdeen Proving Ground, Md., for her work on human factors associated with the National Missile Defense System.
- David Harrah, Richard Kozycki, and Luci Salvi, Human Research and Engineering Directorate, Aberdeen Proving Ground, Md., for their work on the Air Warrior Program.
- Special MANPRINT Achievement Awards to Army Col. Bruce Jette, PM-Soldier, and Army Col. Henry L. Kinnison, TRADOC Systems Management-Soldier, for their work in refining and clarifying requirements for the Land Warrior system.

Keynote Speaker

Patrick T. Henry, Assistant Secretary of the Army for Manpower and Reserve Af-

***Brandenburg**, is an employee of Systems Support & Research Associates, Inc. (SUPRA Corporation), providing contract support to the MANPRINT Office, Office of the Deputy Chief of Staff for Personnel, Headquarters, Department of the Army (HQDA). He holds a bachelor's degree in Business Administration from Virginia Polytechnic Institute and a master's degree in Management from Troy State University. In addition, Brandenburg is a graduate of the Command and General Staff College. **Holz** is the Acting Director, Personnel Technologies Directorate, Office of the Deputy Chief of Staff for Personnel, HQDA. He holds a bachelor's degree in Psychology from Queens College; a master's degree in Communications Research from Boston University; and a doctorate in Social Psychology, also from Boston University. An author and contributing author for many articles, books, and technical/academic papers presented at national and international symposia, Holz has over 27 years of research and policy experience with the Department of the Army.*

fairs, addressed some of the major issues facing today's Army that have major MANPRINT implications.

An overarching question, according to Henry, is how does the Army respond when we are the nation's only power capable of meeting global defense and peacekeeping challenges from terrorist and rogue-nation aggressors worldwide? In addressing those challenges, another question arises – are we, in fact, a full-spectrum Army?

To ensure full-spectrum dominance, the Army needs to attract and keep quality soldiers. Currently, the Army is successful in retaining qualified soldiers, but is experiencing a 7,000-soldier shortfall in recruiting.

Because of that shortfall, a major effort is underway to enhance the recruiting program. The Army can not and should not be perceived as an employer of last resort but rather as a career of choice, rendering valuable service to the nation now and into the 21st century.

In light of the Army's recruitment difficulties, MANPRINT becomes all the more critical, according to Henry, because it targets total manpower requirements for a given system, the skills mix needed to operate that system, and any immediate or future training requirements. Further, MANPRINT brings soldiers an added level of assurance that the systems they operate and maintain are designed with them in mind.

MANPRINT in the Requirements Determination Process

Army Lt. Gen. Randall L. Rigby, Deputy Commanding General – Futures, TRADOC, addressed the system-of-systems concept reflecting the interaction and interdependence of systems, demonstrating the Army can no longer afford to acquire "stovepipe" systems.

Assuring the audience MANPRINT is firmly embedded in the Requirements Determination Process, Rigby maintained that MANPRINT practitioners must be core members of Integrated Concept Teams.

Patrick T. Henry, Assistant Secretary of the Army for Manpower and Reserve Affairs, addressed some of the major issues facing today's Army that have major MANPRINT implications.

The Army Logistics Management College offers MANPRINT training courses and the material is also included in Combat Development-related courses, as well as military and civilian common core curriculum. TRADOC guidance on MANPRINT, including its use in writing Operational Requirements Documents, is defined in TRADOC Pamphlet 71-9.[1] Rigby noted that of the 47 priority programs assigned to him by Army Gen. John N. Abrams, Commanding General, TRADOC, MANPRINT ranked seventh in priority. Clearly, from TRADOC's perspective, MANPRINT is among the "Top 10."

Medical Research Support To MANPRINT

Army Maj. Gen. John S. Parker, Commanding General, U. S. Army Medical Research and Materiel Command, addressed the relationship between medical research and the conduct of Health Hazard Assessments. As medical research identifies an issue or risk, that issue or risk can then be added to the items evaluated during the Health Hazard Assessment process. An example cited by Parker was the need for more research on the effects of non-lethal weapons. With U.S. forces increasingly involved in Operations Other Than War, the use of non-lethal ordnance must be closely monitored to ensure that lethal injuries still do not occur.

MANPRINT in Testing And Evaluation

Army Maj. Gen. Albert J. Madora, Commanding General, U.S. Army Test and Evaluation Command (ATEC), spoke on the evolution of ATEC. Outlining how MANPRINT interfaces with the ATEC Systems Teams, Madora summarized the MANPRINT payoffs, which included improved manpower utilization, lower training costs, reduced maintenance time, and better system performance. He assured the audience MANPRINT is now fully integrated into the testing and evaluation process.

MANPRINT and Digitizing The Force

Stanley H. Levine, Acting Director, Army Digitization Office (ADO), demonstrated how digitization is much more than materiel. Digitization provides a whole new way of supporting the soldier. The Army is moving to Brigade Set Fielding and the system-of-systems concept, which requires a paradigm shift.

Brigade set fielding involves issuing all of the priority 1 and 2 digitized systems a brigade receives in one fell swoop, as opposed to issuing new materiel on a piecemeal basis. This requires that the new systems are subjected not only to MANPRINT in their own right, but also to the interactive effects that such fielding is bound to have on the soldiers who will operate and maintain these new systems.

Army digitization is MANPRINT's greatest challenge, according to Levine, but

DoD photos

will be met with close interaction between the ADO and MANPRINT practitioners.

HRED's MANPRINT Approach: At a Turning Point

Dr. Robin Keesee, Director, U.S. Army Research Laboratory (ARL) – Human Research and Engineering Directorate (HRED), addressed their approach to MANPRINT and use of MANPRINT tools. When MANPRINT started, the emphasis was on developing tools. "Now that we have the tools," according to Keesee, "we need to apply them."

Robert M. Walker, the Army Acquisition Executive at the time, decreed that MANPRINT would be applied to all systems. The challenge facing ARL-HRED addresses meeting this new task with the resources presently available. Being able to apply MANPRINT practices for all new acquisition systems may call for additional resources, which will require careful monitoring.

Teaming for MANPRINT - Lessons Learned

L. Taylor Jones, Director, Targets, Test and Evaluation, Military Technologies, Inc., a former member of the MANPRINT Office staff and PM, delineated his lessons learned on teaming for MANPRINT. MANPRINT must be funded from system concept through fielding and requires the support of qualified, trained personnel. Managers of specific MANPRINT domains, according to Jones, need to do a better job of identifying costs. Additionally, MANPRINT must be embedded in solicitation and source selection/award criteria to gain the contractor's attention up front.

Panel Discussions

The first of four panels – TEAM CRUSADER – focused on managing a MANPRINT program. Representatives included Army Col. Michael Cuff, TRADOC Systems Manager, Fort Sill, Okla.; Kevin Fahey, Crusader Deputy Project Manager; and Dave Wallestad, currently the Director for Advanced Programs and the former Program Director, United Defense Limited Partnership (UDLP). Discussing the need for user

Army Lt. Gen. Randall L. Rigby, Deputy Commanding General — Futures, TRADOC, addressed the system-of-systems concept reflecting the interaction and interdependence of systems, demonstrating the Army can no longer afford to acquire "stovepipe" systems.

juries, tiger teams, and subject matter experts who are MANPRINT-trained, the panel maintained MANPRINT must be at the System Engineering and Integration level, as well as on product teams. Additionally, there must be early management commitment to MANPRINT, and requirements must be resourced. A MANPRINT Working Integrated Product Team should prepare the System MANPRINT Management Plan to identify and track key issues. According to the UDLP team, applying MANPRINT practices has led to a projected $2.4 billion cost avoidance for CRUSADER.

The second panel presented an update on regulations. Marjorie Zelko, MANPRINT staff officer, Personnel Technologies Directorate, Office of the Deputy Chief of Staff for Personnel, HQDA, discussed the Draft Army Regulation 602-2, which addresses the MANPRINT program.[2] Her office handles policy oversight of MANPRINT for the Army.

Jim Inman, an Acquisition Policy Specialist, Office of the Assistant Secretary of the Army for Acquisition, Logistics & Technology, discussed Army Regulation (AR) 70-1[3] and Department of the Army Pamphlet 70-3.[4] AR 70-1 will either be replaced or changed, and it appears the Department of Defense Regulation 5000.2-R[5] will be rewritten and drive Service changes. DA Pamphlet 70-3,[6] which was approved July 15, mirrors the contents of DoD 5000.2-R. Inman emphasized MANPRINT must sell itself as providing "value added." Specifically, MANPRINT representatives on Integrated Product Teams must be empowered to offer recommendations to the PM that, when implemented, will result in improved systems being fielded.

The third panel addressed perspectives from military forces outside the United States. Representatives consisted of Philip Sutton from the United Kingdom; Andrew Vallerand, Canada; Manfred Roettle, Germany; and Col. Noam Kimmel, Israel Defense Forces. They discussed the history, scope, structure, and status of their MANPRINT-equivalent programs. A total of 10 foreign representatives attended the symposium. The U.S. Army MANPRINT program, as the first such effort, provides a benchmark to evaluate other similar programs.

The fourth and final panel discussed MANPRINT tools. Subject matter experts from the U.S. Army Research Laboratory, U. S. Army Total Army Personnel Command, and U.S. Army Safety Center, joined by representatives from the U.S. Army Center for Health Promotion and Preventive Medicine, and the Office of the Deputy Chief of Staff for Personnel, discussed tools used within their agencies. In many cases, the agencies

developed their own tools. Their presentations reinforced Dr. Keesee's conclusion that MANPRINT tools available need to be used now.

The Earlier the Better

The symposium concluded with Dr. Robert F. Holz, Acting Director, Personnel Technologies Directorate, Office of the Deputy Chief of Staff for Personnel, reminding the audience that resourcing is the key to a successful MANPRINT program. Additionally, Holz stressed the need for MANPRINT practitioners to work with the PM at the earliest possible stages of the acquisition process.

Since 70 percent of the decision costs for a new system are determined by the time a program reaches the end of Milestone I, such early involvement is essential for MANPRINT to positively impact DoD systems development.

Editor's Note: Feedback from the symposium was universally laudatory, with many respondents recommending that the Army continue an annual MANPRINT Symposium. The author welcomes questions or comments on this article. Contact him at **Robert.Holz@HQDA.Army.Mil**. For more information about MANPRINT, go to **http://www.manprint.army.mil/**.

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1. *Requirements Determination* TRADOC Pamphlet 71-9 (TRADOC, Aug. 1, 1998
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3. *Army Acquisition Policy*, AR 70-1 (Department of the Army, Dec. 15, 1997).
4. *Army Acquisition Procedures*, Army Pamphlet 70-3 (Department of the Army, Feb. 28, 1995).
5. *Mandatory Procedures for Major Defense Acquisition Programs (MDAP) and Major Automated Information Systems (MAIS) Acquisition Programs*, DoD Regulation 5000.2-R (OSD, March 1996).
6. *Army Acquisition Procedures*, DA Pamphlet 70-3 (Department of the Army, July 15, 1999).

New DSMC Guidebook Available!

A new text on *Systems Engineering Fundamentals* (October 1999) is now available. Topics include the systems engineering process; system analysis and control; and planning for, organizing, and managing systems. The guide provides a basic, conceptual-level description of systems engineering management as it relates to the development and life cycle management of a system, including basic concepts, problem solving, tools to balance the process, and issues integral to the systems engineering management effort. The text supplements course material at DSMC and is the first guidance issued on the topic of systems engineering since publication of the *Systems Engineering Management Guide* (1990).

Government Personnel Requesting Single Copy

Government personnel interested in obtaining a single copy of the guide may fax their single copy requests on official stationery to DSMC at: (703) 805-3726.

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The Government Printing Office (GPO), the Defense Technical Information Center (DTIC), and the National Technical Information Service (NTIS) are also sources for DSMC publications.* Contact:

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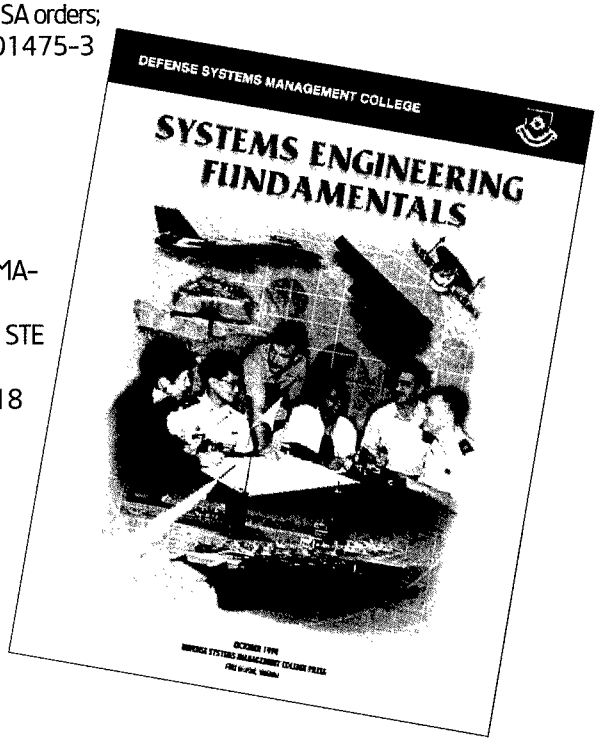


** DTIC ADA number will be announced soon.*

AMERICAN FORCES PRESS SERVICE

New DoD Initiative Proves There's Power in Numbers

PAUL STONE

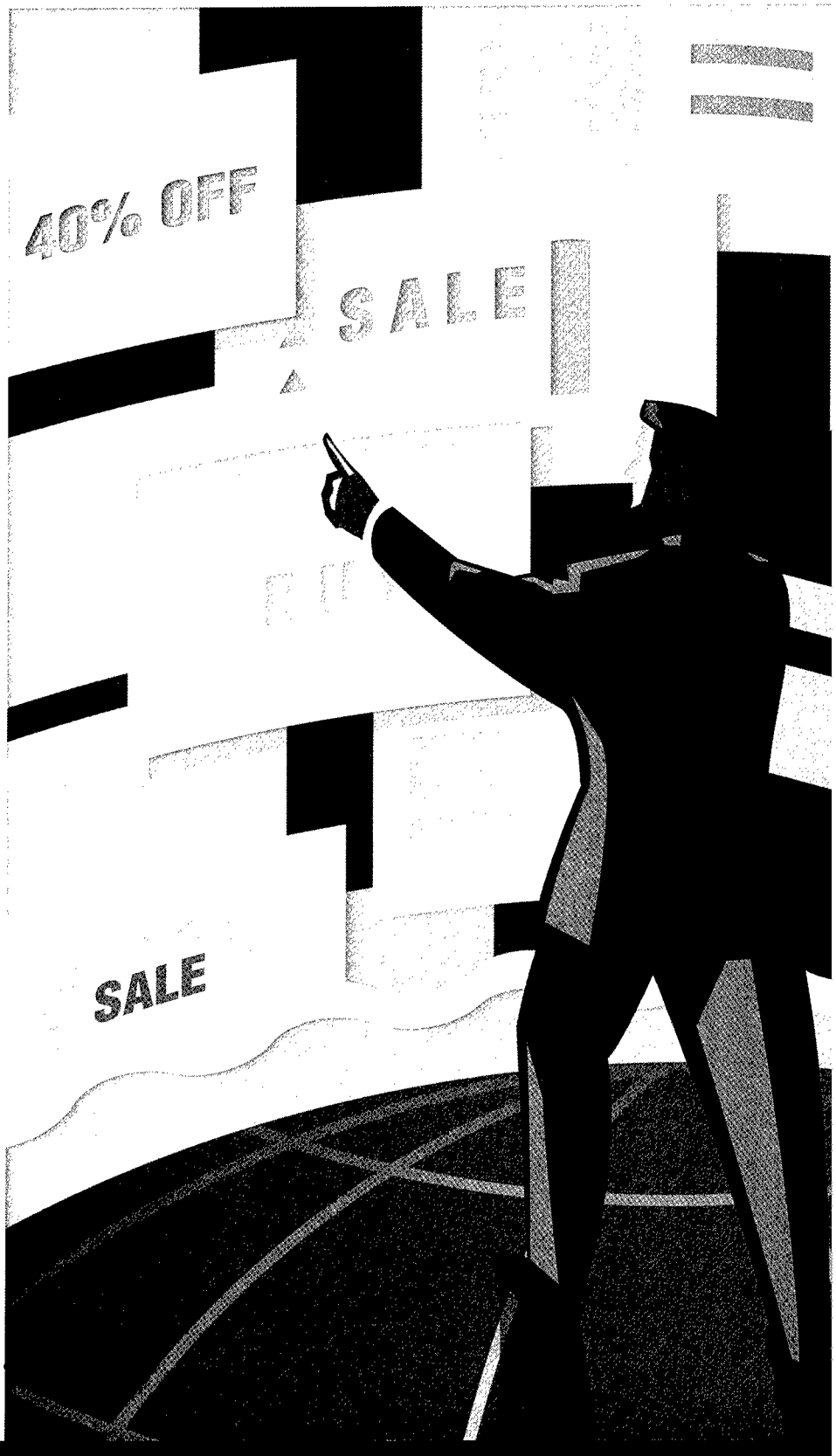
WASHINGTON – If you use a personal computer at work, and chances are you do, then chances are you are or will be participating in a DoD-wide program that's avoiding millions in costs for software.

Under a relatively new and little known program called the Enterprise Software Initiative, commonly referred to as ESI, DoD is leveraging its power as the largest federal user of computers to negotiate below-market prices for commercial software.

With more than two million software users throughout the Services and various defense agencies, DoD realized it was in a good position to get high-quality products cheap if it could convince the Services to work together, according to Navy Cmdr. Jim Clausen, who works with the initiative in the Office of the Assistant Secretary of Defense for Command, Control, Communications and Intelligence.

Clausen said that prior to the initiative, Services bought software individually through standard purchasing procedures. Under the ESI, however, DoD negotiates agreements with vendors in specific software categories to get the lowest prices on software, maintenance, and support for all the Services.

A committee of representatives from all Services and selected defense agencies meets once a week to discuss potential software buys. The key, Clausen said, is that 80 percent of the committee agrees on a purchase.



Editor's Note: *This information is in the public domain at* ***http://www.defenselink.mil/news.***

"Once we have that level of interest in a particular piece of software, then we ask one of the Services to be the lead agency for negotiations," he said. For example, the Army has taken the lead for negotiating agreements for database software. The Navy negotiates for automation software, and the Air Force handles records management areas.

The lead agent then makes the purchase using money from the Defense Working Capital Funds [DWCF]. Once the software is acquired, the lead agency sells it to DoD customers and repays the DWCF.

Under the ESI, DoD negotiates agreements with vendors in specific software categories to get the lowest prices on software, maintenance, and support for all the Services.

Since July 1999, software agreements have been completed with the companies that make Visio graphics software; Corel desktop; Oracle, Informix and Sybase database software; and Provenance and PS Software electronic records management software. The negotiations saved about $75 million, Clausen said.

Additionally, the Navy, serving as the lead agency, is negotiating a new DoD-wide agreement with Microsoft to cover all server products. Agreements are also under discussion with Adobe, JetForms, Lotus Development Corp., and Sun Microsystems.

Because of the size of its purchases, DoD has found it sometimes pays less than half the price offered to the General Services Administration. GSA usually pays the lowest prices among government agencies and offices.

"Our motto is nobody's going to beat our prices," Clausen said. "And what we've found is that software companies like this way of doing business. Although we benefit financially, the companies get a large market share, and their products are getting wide exposure."

He said the new business practices are part of the acquisition reform process. They're part and parcel of the Defense Reform Initiative – DoD's overall effort to cut costs and make more efficient use of resources.

In addition to greatly reduced software prices, Clausen said, DoD negotiated flexible licensing agreements that allow programs to be transferred from one computer to another. This, he said, will help DoD customers avoid additional software costs down the road.

"Typically, when agencies replace computers they routinely throw out the old and replace it with one containing all new software, even though much of the software may be the same as on the old system," Clausen explained. "They won't have to do that with the software we purchase through the ESI. We'll be able to transfer those licenses clear across the world if needed, shifting assets back and forth throughout DoD rather than writing a new check for more software."

Although the initiative is still in its infancy, Clausen said plans are underway for software purchased through the ESI to be available through the Defense Logistics Agency's Electronic Commerce Mall. Customers eventually will be able [to not] only purchase the software online, but download it and the licensing agreement directly from DLA.

For now, however, the ESI is concentrating on getting the best products at the best price.

"That's our challenge – to keep up with the various deals either in place or being worked so we can negotiate even lower prices," Clausen said.

DoD's efforts were rewarded in September when the ESI working group received the 1999 Interagency Resources Management Conference [IRMCO] award for team achievement. The IRMCO is the federal government's premier conference on information technology and agency business solutions. More information on ESI can be obtained through the Internet at **www.nawcad.navy.mil/its/EnterpriseSoftware.**

Gansler Addresses International Test and Evaluation Association

Strengthening Defense Testing — A Challenge to the Community

UNDER SECRETARY OF DEFENSE (ACQUISITION & TECHNOLOGY), DR. JACQUES S. GANSLER DELIVERED THE FOLLOWING REMARKS TO THE INTERNATIONAL TEST AND EVALUATION ASSOCIATION (ITEA) SEPT. 22, IN ATLANTA, GA.

This morning, I want to spend a few minutes talking about testing from the Acquisition and Technology perspective, specifically as it relates to both our warfighting and management needs for the coming years, i.e., to the Revolution in Military Affairs [RMA] and to the Revolution in Business Affairs [RBA].

As you know, we have recently completed a significant reorganization of our Testing and Evaluation Community, in order to strengthen our overall program. I also want to discuss that with you and give you my views on why I believe it is a key element in our overall efforts to achieve the combined goals of the RMA and the RBA.

T&E Goals From a Global Perspective

I think it is important to begin, however, with a brief overview of the geopolitical situation and put our testing and evaluation goals into a global, strategic perspective. Not too long ago, we could refer to "future" or "predicted" threats emerging in the early years of the 21st century. Recent events – the North Korean and Iranian missile launches, the terrorist attacks on our embassies in Africa, the nuclear explosions in India and Pakistan, the repeated, sophisticated cyber attacks on U.S. Defense Depart-

PICTURED IS A MINUTEMAN INTERCONTINENTAL BALLISTIC MISSILE (ICBM). THE BALLISTIC MISSILE DEFENSE ORGANIZATION'S NATIONAL MISSILE DEFENSE JOINT PROGRAM OFFICE ANNOUNCED OCT. 2. IT HAS SUCCESSFULLY COMPLETED THE FIRST TEST INVOLVING A PLANNED INTERCEPT OF AN ICBM TARGET. THE TEST SUCCESSFULLY DEMONSTRATED "HIT TO KILL TECHNOLOGY" TO INTERCEPT AND DESTROY THE BALLISTIC MISSILE TARGET.

Photo courtesy Boeing

ment information systems – all these have made us painfully aware that those threats are with us now.

The end of the Cold War, the breakup of the Soviet Empire, the emerging power of rogue nations, the rise of transnational terrorist threats, and other equally dramatic geopolitical events – accompanied by revolutionary advances in science and technology – are transforming our vision of 21st century security needs and military strategy. At the same time, rapid globalization of industry and the increasing importance of coalition warfare are creating issues that the United States and its partners must face in the immediate future. All these changes make our need to respond to this new environment an urgent one.

Two Fundamental Changes

Two fundamental changes seem clear: First, we will see more short, intense regional conflicts – often followed by extended periods of peacekeeping. And, second, our military will seek to project power without putting a large number of forces at risk. Massed forces will be replaced by massed firepower, precisely placed on targets. Modern, so-called "reconnaissance/strike" warfare (often referred to as the essence of the "Revolution In Military Affairs") is based on two things: real-time, all-weather, accurate and secure information systems, combined with long-range, unmanned, "brilliant," highly lethal weapons designed to achieve precision kills.

Obviously, such changes in the nature of future conflict not only require different equipment, but – perhaps even more important – require a significant change in doctrine, tactics, organization, equipment, and, particularly, decision making – a task made far more difficult in a coalition environment.

Coalition Operations

Yet, the current and likely future geopolitical situation will generally foster – in fact, usually require – coalition operations. In this environment, each nation's security is highly interdependent on the performance of its coalition partners. This means that our allies' systems must be fully interoperable – and equally secure; and these characteristics must be fully demonstrated long before any future conflict.

"Current cycle times run as long as 18 years for major systems. If we are to continue to outpace our adversaries, we must begin to think in terms of very short cycles – 18 months is the norm for current commercial information systems."

Unfortunately, much of the new technology available to us is also readily available to potential enemies; for example: commercial communications/navigation/earth surveillance satellites; low-cost biological/chemical weapons; cruise and ballistic missiles, etc. (which, if they can't develop them, they can purchase them – and the skills to use them – on the world arms market). Therefore, we must develop effective countermeasures to this technology; for example: information warfare defenses; vaccines and special medical agents to counter biological and chemical weapons; defenses against ballistic and cruise missiles; and the ability to destroy hard and deeply buried targets are all required; and, again, need to be demonstrated – an expensive and difficult challenge.

In addition to developing and deploying countermeasures to our adversaries' use of advanced technology (weapons of mass destruction, information warfare, etc.), perhaps the most important implication of the revolution in technology and its global spread is the speed with which our adversaries can lock on to our technology. Since the terrorist or rogue nation can easily acquire much of their required advanced technology on the world arms market or from readily available commercial sources, our advantage is quickly lost unless we keep at least two steps ahead of the enemy. This requires us to reduce cycle times in the development and procurement of new weapons systems, and in the modification of existing systems. Current cycle times run as long as 18 years for major systems. If we are to continue to outpace our adversaries, we must begin to think in terms of very short cycles – 18 months is the norm for current commercial information systems. In order to meet the demands for such vastly reduced cycle times, we must be willing to abandon traditional methods of acquiring advanced technology. And, since testing is often the "long pole in the tent," new approaches are clearly required.

Emulating World-Class Commercial Practices

One place we have been looking for ideas on how to revise our acquisition practices to match the needs of the likely 21st century environment is to emulate – where appropriate – world-class commercial practices. In recent times, testing and evaluation of weapons systems in the defense procurement process have been focusing on very different rationale than in the commercial world. Commercial testing focuses on going "outside the envelope," as they say, with the intention of getting a product to fail in order to clearly determine the failure modes and to make the design more robust. That way, we learn from our failures. Defense testing, on the other hand, has become more like a final exam. (So much so, that in some cases, one or two

successes, inside of the envelope, are considered adequate to go ahead.)

We recently published the results of a study on commercial T&E best practices. What we found in this study is that, in commercial testing the technology is usually demonstrated first; requirements and specifications for a product exploiting that technology are then created based on market (or "needs") analysis; and product development and testing are then done to determine if the technology was successfully incorporated into a product [that] satisfies the customer.

In DoD, the requirements are expressed for a system to meet a set of mission needs; technology is then sought as an answer to the requirement question. As a result, the technologies are frequently not as far along or as well understood. The difference between the DoD and commercial paradigms affects their respective conduct of T&E. In testing a DoD system against its requirements, two basic failure modes can be revealed: (1) technology failures; and (2) failure of the system to meet its mission needs.

In the commercial paradigm, characteristics of the technology (including limitations) have already been incorporated into the requirements, so that commercial testing mainly has to address how well the product meets the needs of the market. The DoD approach thus tends to involve far more risk – and, usually, much more time – because it may ask an inappropriate or immature technology to do more than it has been shown capable of.

When we begin to think of testing as an integral part of the procurement process and less as a final, pass/fail exam, we realize that, if we can begin operational (user) testing much earlier, we can drastically shorten our weapons cycle times. Also, because of the rapid evolution of modern technology, we must be prepared for frequent – and continuous – updates to our existing systems. Finally, we must consider the fact that many of our upgraded systems will contain commercial elements. Each of these changes is a critical challenge for the testing and evaluation community.

Increased Use of M&S in DoD Testing Programs

One way to meet these challenges is to make far greater use of modeling and simulation in our test and evaluation process. There is no reason that we have to choose between "test"' and "simulation." They are not competing functions. Instead, they are complementary and mutually supportive approaches to understanding weapon system performance. Obviously, simulations are of extremely limited value if they are not validated by realistic system and subsystem testing. Conversely, testing alone can be of extremely limited value – considering the very few data points obtained with the exceptionally high cost of modern weapons, and the vast array of possible test conditions. Simulation and modeling are clearly required to, at least, fill in the rest of the envelope. (In fact, in many cases, there is a good argument that can be made for using testing primarily to validate models and simulations.) As we move more and more to concepts of "systems of systems" –where, for example, remote sensors are linked to weapons that are retargetable in flight – and where the cost and complexity of the testing is dramatically increased, the use of simulations becomes even more critical in representing various elements within the system of systems.

You have heard many of the criticisms about modeling and simulation: that physical prototypes are the only way to see what you have; that you can't really believe simulations; that nothing can replace real testing; and that there's no incentive to develop models and simulations because the payoff is too far into the future.

I don't agree. I am committed to the expanded use of simulation and modeling in our testing programs, because we are already beginning to see impressive results – and, frankly, I see no choice. I know Phil Coyle has been advocating more effective use of modeling and simulation, also. And, as more and more of our acquisition workforce 'buy in' to the notion that modeling and simulation can pay big dividends – in terms of improved performance, reduced cycle time, and reduced costs – the barriers to the use of this impressive technology will collapse.

Overall, I believe that the various changes in military requirements, business practices, and modern technologies have the following implications for DoD testing:

- Shorter development cycles require that we must begin testing much earlier in the development process, and we must perform this early testing in more realistic operational situations (for example, in the presence of likely countermeasures, such as information warfare).
- As we become more successful in focusing new weapons on the use of demonstrated technologies, then the emphasis in testing shifts to the integration of these elements in the weapon system and to the determination of whether it meets the user's needs – including the interfaces with other systems in a joint and coalition environment.
- As we expand our efforts to adopt commercial products and processes to defense procurement, we must seek closer ties between commercial testers and government testers. We must also be aware that a previously tested commercial product embedded in one system may present new problems when embedded in a different system.
- We must test outside the[box] in order to determine failure modes and to enhance the robustness of the system. Our objectives in testing must be both to learn and to confirm. Testing is not only a "pass/fail" final exam; it is an integral part of the development process. Thus, we must test early and often.
- We must be continuously testing, not only to develop critical new systems, but also to improve and upgrade existing systems. Rapid technological change requires an acquisition process that assumes a "spiral" development, test, and deployment process.
- We must make far greater use of modeling and simulation – to cut costs, as well as to shorten development cycles;

and these simulations must expand to address the growing interoperability requirements of modern systems-of-systems.

- Finally, I see testing and evaluation taking on an increasingly prominent role in the growing area of information warfare and security. Here again, we see an area that lends itself well to modeling and simulation testing, but one also requiring a demand for continuous awareness of the rapidly changing state-of-the-art.

Interoperability

One point I must emphasize is the growing importance of interoperability. It will pose a major challenge as we develop sophisticated systems-of-systems to meet the challenges anticipated in the early 21st century. We consider this area to be a top priority. To underscore it, I have recently formed an Office of Interoperability and have named a Director, V. Garber, who is already at work to move us more rapidly toward our goals. He will work closely with Phil Coyle and his staff, as we increasingly emphasize interoperability in our early operational testing. Recently, the Vice Chairman of the Joint Chiefs of Staff, General Ralston, and I signed a Directive requiring the addition of "Interoperability" to the list of Key Performance Parameters for all Operational Requirements Documents and Capstone Requirements Documents. I might add that this Directive also requires that "cost" be included as a military requirement in all our new weapons requirements documents. This is a critical incentive to apply cost-conscious commercial approaches in all aspects of DoD acquisitions – including testing. The objective is not to simply cut costs; rather it is to encourage process changes that will result in higher quality and performance at lower overall costs. This is what world-class firms are achieving and what we must learn to do.

Organizational Changes

Institutionally, to help us achieve the needed changes required in our defense testing processes, we have made some significant organizational changes aimed at bringing together the people and resources to strengthen Testing and Evaluation. Phil Coyle will be briefing you on the details of this reorganization later in the week, with emphasis on the expanded responsibilities and duties of Operational Testing and Evaluation.

"We must produce our weapon systems on greatly reduced cycles, and with greatly enhanced performance. We must also do all this at greatly reduced cost. Testing throughout the developmental process is a key to our success in these objectives."

Phil and I have worked very closely on this reorganization and believe it will get operational testers involved much earlier in the acquisition cycle and, most important, help identify and solve problems early. Unless we do this, our new equipment, our modifications, and our systems will cost more and take longer, with far greater overall risk.

I realize that there has been some confusion as to what happened to our Developmental Test and Evaluation component as a result of this reorganization. Rest assured, it is alive and kicking. This function is of great importance to me and will continue as a vital Acquisition and Technology responsibility. What I was looking for was greater integration of this activity with our overall weapons development policy and oversight. So, I have established an office under George Schneiter in Strategic and Tactical Systems, responsible for all developmental test and evaluation activities. Rick Lockhart heads up this office and will essentially continue to perform many of the functions that were done under the previous organizational structure, including responsibility for directing the Joint Test and Evaluation Program. Rick will also be briefing you later in the week on the DT&E office's roles and responsibilities.

Great People — Just Old Processes

In summary, testing – developmental and operational – are essential to both the Revolution in Military Affairs and the Revolution in Business Affairs. We must produce our weapon systems on greatly reduced cycles, and with greatly enhanced performance. We must also do all this at greatly reduced cost. Testing throughout the developmental process is a key to our success in these objectives. This puts our testing community on the front lines of the Revolution – and as an integral part of the acquisition team. You, as testers, have a significant challenge – and a tremendous opportunity to play a leadership role in the required transformation.

We have great people, just old processes. We are changing those processes, matching great people with the policies and tools they need to do the job. We count on you. But, much more important, our fighting men and women count on you. And, overall, the American people count on you to keep our nation safe and secure. I know we'll be successful.

Editor's Note: This information is in the public domain at **http://www.acq.osd.mil/acqweb/usd**.

AMERICAN FORCES PRESS SERVICE

DoD Travelers Can Soon Access Charge Accounts

LINDA D. KOZARYN

WASHINGTON – Servicemembers and DoD employees traveling on official business soon will be able to call up their personal travel card accounts on the Internet.

The Electronic Account Government Ledger System, known as EAGLS, now gives DoD travelers Internet account access. About 1,000 cardholders began testing the new program Sept. 1. Defense Finance and Accounting Service officials here say they hope to have DoD's 1.1 million cardholders online in the next year.

When fully implemented, each cardholder will receive a password, an identification code, and an instruction booklet, according to De Perrin, DoD Travel Card Program manager. Card holders will then be able to view charges, check payment status, and obtain other account information on the PC-based point-and-click system, she said.

Until now, only agency program coordinators had access to EAGLS data, said Myra Woods, Bank of America senior vice president for government card services. These include monthly reports detailing cardholders' account activities and spot readings allowing coordinators to see and assess their cardholders' charges within 24 hours of being incurred, she said.

DoD began issuing travel cards in 1983, first Diners Club and later American Express. In April 1999, NationsBank won the DoD contract to supply VISA cards. NationsBank recently merged with Bank of America, one of the largest banking companies in the country. The merge doesn't affect individual cardholders, Woods said.

Bank of America sent monthly statements in August notifying all DoD cardholders of the merger. Cardholders will also receive new legal disclosure statements. NationsBank cards are good until they expire, after which the bank will issue travelers Bank of America VISA cards.

DoD's switch from American Express to VISA gave DoD travelers more access to worldwide services, Perrin said. VISA cards are a "much more highly recognizable piece of plastic," she said. "VISA works in Kosovo, for example. We just moved a large contingent in and out of Kosovo."

DoD travelers are responsible for using the VISA card to purchase only official travel-related services and for paying charges by the statement due date. Any other kind of charge is strictly prohibited, as is the use of the card by anyone other than the designated traveler.

Cardholders must ensure accounts have current addresses and other information. They must report a lost or stolen travel card by calling Bank of America customer service at 1-800-472-1424 immediately and their agency program coordinators at the first opportunity during normal business hours.

Bank and DoD finance officials monitor travelers' accounts. If unauthorized charges are detected, agency program coordinators notify the cardholder's immediate supervisor,

who then contacts the person and determines if disciplinary action is required.

Perrin said 99 percent of DoD people travel correctly 99 percent of the time, but there are lapses. Sometimes a traveler claims not to have known the rules, or a card falls into the wrong hands, she noted.

In some cases, Perrin added, cardholders have said they mistakenly used the DoD card instead of a personal charge card. When cardholders realize they've made such an error, she added, they can call the bank's customer service department for help.

Information and technical help for using the card and EAGLS is available on the Internet at **http://www.bankofamerica.com/government** and "The Cardholder Program Guide," a booklet available from agency program coordinators, Perrin said.

Another feature of the travel card program allows travelers to authorize direct payment to Bank of America. Up to 12,000 DoD travelers a month use the "split disbursement" option. Block 1 on DD Form 1351 travel voucher allows travelers to authorize the amount of reimbursement paid directly to the bank by an electronic transfer.

"It's convenient for our customers. Our cardholders don't have to pay for that stamp, and they don't have to worry about mailing the bill," Perrin said. "The government voucher then indicates the amount paid, and the Bank of America statement indicates the amount received.

"This has been a really great thing for big ticket items," Perrin continued. "Hotels, rental cars, cash – they're all paid directly for you at voucher settlement. It's highly automated. It's fast." Cardholders also don't have to worry about still being on the road when the bill arrives at home or about inadvertently missing payments, she said.

Split disbursements, offered since 1994, Perrin said, are now available through most major disbursing systems. Some servicemembers and DoD employees don't have access, particularly those serving outside the continental United States or in the Marine Corps, she noted.

Editor's Note: This information is in the public domain at **http://www.defenselink.mil/news.**

On the Ethics of Outsourcing

A Philosophical Look at A-76

DAVID A. BRESLIN

What are the financial benefits to the organization and, ultimately, to the customer regarding the benefits of outsourcing in private industry? Does outsourcing improve responsiveness, quality, flexibility, and even provide a better focus on core business functions? For managers in private industry considering the benefits of in-house vs. outsourcing, the answers to these questions weigh heavily when making a decision on whether to outsource. Within government, the guidebook to federal outsourcing is Office of Management and Budget (OMB) Circular A-76, *Performance of Commercial Activities*, Aug. 4, 1983, which is in close agreement with these precepts of business and speaks specifically of achieving economy and enhancing the productivity of non-core functions.

Why Ethics?

All of these considerations are wonderfully objective metrics in the world of business and government and greatly facilitate the decision on whether to outsource. However, these considerations are also somewhat cold and lack a humanistic element, especially for those employees who are being outsourced. The plight of the people being laid off is cause to wonder whether other considerations, traditionally omitted from the balance sheet, should be examined – considerations such as *ethics*.

Those who have studied ethics seriously, or have even audited a single college course on ethics know that on that particular subject, no end is in sight, and rarely is there an easy answer. A person can be buried very quickly under the works of the classical Greeks, and that does not even get you into the last 2,000 years of ethical debate. Although no easy answers emerge, viewing outsourcing from the standpoint of a few ethical concepts is still an interesting undertaking. A disclaimer, however, is first required. The intent of this article is not to provide a definitive answer, but rather a single opinion that will no doubt be subject to much debate.

Do the Ends Justify the Means?

The works of Niccolò Machiavelli are read today more out of curiosity than for any sort of ethical or moral guidance. That is probably a good thing, since Machiavelli believed: *The ends justify the means.* Today, the U.S. culture generally accepts: *The ends do not justify the means.* Further, we have a Bill of Rights and a healthy legal system designed to support that philosophy. However, there do seem to be a few exceptions in our culture, especially in corporate America and increasingly in government, where cost as an *end* is used to justify many decisions.

For example, in order to increase profitability through reduced costs (the *end*), corporations are, among other things, leveraging the use of outsourcing (the *means*). Of course, a corporation would never defend an action by arguing: *The ends justify the means.* Nevertheless, the Machiavellian model is quite visible at times.

Reducing the vast economic complexities and rationale for a corporation's actions to a simple set of *ends* and *means* is certainly not fair. After all, a corporation has a legitimate interest in self-preservation, offering competitive prices to its customers, and providing monetary rewards to top managers and those who assume risk by buying the company's stock.

The government has different yet similar motivations. In reality, a vast number of *ends* and *means* are constantly at work. Furthermore, outsourcing is widely accepted in our culture and it must be pointed out that this *end* (reducing costs) has a tendency of improving the econ-

What are the human costs of outsourcing? From a financial perspective, some employees who are forced to take jobs in private industry lose their retirement and health insurance benefits as well as witness a reduction in salary, even after factoring in severance. Some employees experience reduced vacation time, sick leave, and job security ... Many displaced federal employees pay a heavy price.

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omy and raising the standard of living for society as a whole. That is a very utilitarian *end* in itself, and most would agree that our economic system has generated amazing results for the majority of participants. Therefore, the *end* is good and generally applauded. A question could still be raised, however, regarding whether alternative *means* could be employed.

When addressing the strategies employed during the Civil Rights movement, Martin Luther King argued: *The means we use must be as pure as the ends we seek.* As *ends* go, economic prosperity certainly appears to be very pure. Can the wisdom in King's words be used to help us identify *means* that are equally as pure?

Do Unto Others...

The so-called *Golden Rule* continues to play an important role in humanity, not just for people of many religions but also for agnostics and atheists as well. Many believe that "Do unto others as you would have others do to you," is part of the unwritten social contract under which we live day to day. Most of us are unaware, however, that the *Golden Rule* has been subjected to much tinkering and philosophical debate over the centuries.

Thomas Hobbes, while observing civil war in England and its effects on the general populace 300 years ago, was very concerned about people doing to others as they would have done unto them. Therefore, Hobbes pleaded: "Do *not* do unto others as you would *not* have others do unto you."

Jean Jacques Rousseau took a slightly different approach and argued: "Do good to yourself with as little evil as possible to others."

Immanuel Kant also weighed in by offering his Categorical Imperative that says in effect: "Never treat another human being as a means only, but always also as an end." [There are those *ends* and *means* again!]

Today, our contemporaries such as Stephen Covey continue to beat the drum by urging us to think, *win-win*. Tinkering aside, most of us seem to have an intuitive understanding of what the *Golden Rule* really means.

Are there any practical applications of the *Golden Rule* when it comes to outsourcing in government? For one, the *Golden Rule* can be used to test the purity of our actions, as Martin Luther King might have us do. What if we apply the *Golden Rule* and its variations to the subject of outsourcing? Would the managers who decide to outsource others ever decide to outsource themselves? It is all too clear what their answer would be. It is unclear, however, why the private sector could not make such decisions just as effectively as, and perhaps less expensively than, those managers.

So, where does that leave us? Well in the ideal world, we should be able to adopt the *Golden Rule* and its more recent variations as a construct upon which we base decisions we make. We should be able to ask, "Would I want to be out-

sourced?" or, if pragmatism must prevail, "Under what conditions would I myself accept being outsourced?" and proceed from there.

Economic Justice

Karl Marx will always be a risky reference to use when trying to argue any point within the U.S. Government due to his eternal association with communism. If we can put politics aside for a moment, however, we must recognize that Marx contributed greatly to the advancement of the working class. Marx, of course, was concerned with the capitalist making an unreasonable profit at the expense of the laborer and questioned ethical aspects through his monumental work, *Capital*.

With the rise of child-labor laws, the minimum wage, the 40-hour workweek, Social Security, the Occupational Safety and Health Administration, and a host of other controls and safety nets, many if not most of Marx's concerns have been effectively addressed. Nevertheless, we must keep in mind that the economic benefit of outsourcing is lower costs. Lower costs are attributed to greater efficiency and competition. Savings through competition are often the result of competition among the workforce, thereby driving down salaries and benefits. Thus, as might have been cautioned by Marx over 100 years ago, the economic benefits from outsourcing are often derived from the pockets of the employee.

OMB Circular A-76 establishes federal policy regarding the performance of commercial activities. Basically, this policy recognizes that, in the process of governing, the government should not compete with its citizens. It also recognizes that Americans want "to get their money's worth" and, therefore, it becomes imperative for the government to achieve economy and enhance its own productivity. One cannot argue with these fine goals, and one might be inclined to categorize these *ends* as pure.

For those activities that are not inherently governmental, A-76 briefly walks through the process by which one makes solicitations, compares cost and performance, and ultimately decides whether an activity should be outsourced. Although personnel considerations are specifically addressed by A-76, those considerations are limited to giving displaced employees training, access to placement programs, and right-of-first-refusal for outsourced jobs. Perhaps not surprisingly, the human costs of outsourcing are not specifically addressed.

What are the human costs? Well that depends on the situation. From a financial perspective, some employees who are forced to take jobs in private industry lose their retirement and health insurance benefits as well as witness a reduction in salary, even after factoring in severance. In addition, some employees experience reduced vacation time, sick leave, and job security. Of course, that is not true for all employees. Some employees are picked up by priority placement, thus retaining their benefits, and some employees actually do better in the private sector. Nevertheless, the fact remains that many displaced federal employees pay a heavy price.

Consider the following. In one analysis of employment covering 1991 and 1992, the Bureau of Labor Statistics (BLS) found that the incidence of coverage for paid sick leave, medical and dental care, and life insurance was higher among public-sector employees than their private-sector counterparts. With respect to retirement income, 90 percent of public employees were covered compared to 54 percent of private employees. More specifically, the BLS found that public employees were more than twice as likely (83 percent) to be covered by a defined-benefit pension plan than their counterparts in the private sector (34 percent). Many other studies offer similar findings. No wonder government employment is often considered a good deal, and no wonder the private sector can, at times, provide services at a lower cost than the government, even after factoring in a reasonable profit.

Alternative Means

If we agree with Martin Luther King, "The means we use should be as pure as the ends we seek," and if it is legitimate for us to ask, "Under what conditions would I myself accept being outsourced," what alternative to the current method might we offer? Recognizing that some employees who are outsourced do poorly, perhaps we could add a filter to the A-76 process.

For example, before determining whether a function would be better performed by the private sector, could we first assess whether the affected employees are likely to be better off or worse off at the outcome of the process, and then proceed based on that finding? Of course, we would not want to create a welfare system for expensive and inefficient federal workers, where guaranteed employment removes all incentive to improve systems and processes. Rather, this is suggesting that consideration should be given as to whether the gains to the government should come at the expense of the hapless federal employee. In other words, there is, in fact, room for middle ground.

In the real world, many considerations must be addressed before making business decisions, and the considerations of A-76 are cost and effectiveness. One can argue that to make business decisions based on the purest sense of ethics, without addressing economics, politics, or related issues, is to forgo necessary pragmatism, and ultimately is self-defeating. However, it does not have to be a case of *either/or*. Maybe ethics should be given a more dignified seat at the table, where the human costs of outsourcing are given thoughtful consideration. What if we went for a *win-win* and challenged ourselves to outsource only when the displaced employees also benefited in the process? We might be pleasantly surprised by the outcome.

Alas! Even if we so desired, neither the Department of Defense nor the individual program manager has any authority to change the A-76 process.

Editor's Note: The author welcomes questions or comments on this article. Contact him at **BreslinDA@navsea.navy.mil.**

Gansler Expands Existing Policy on SPI

THE UNDER SECRETARY OF DEFENSE
3010 DEFENSE PENTAGON
WASHINGTON, D.C. 20301-3010

14 SEP 1999

ACQUISITION AND TECHNOLOGY

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
CHAIRMAN OF THE JOINT CHIEFS OF STAFF
UNDER SECRETARY OF DEFENSE (COMPTROLLER)
ASSISTANT SECRETARY OF DEFENSE (COMMAND, CONTROL, COMMUNICATIONS AND INTELLIGENCE)
GENERAL COUNSEL OF THE DEPARTMENT OF DEFENSE
INSPECTOR GENERAL OF THE DEPARTMENT OF DEFENSE
DIRECTOR, OPERATIONAL TEST AND EVALUATION
DIRECTORS OF THE DEFENSE AGENCIES

SUBJECT: Corporate Councils

The Single Process Initiative (SPI) has resulted in the formation of industry-initiated Corporate Councils by several companies, designed to provide leadership for corporate-wide initiatives, strengthen the relationship with the Department, and elevate SPI proposals for corporate-wide endorsement and implementation. These Corporate Councils offer the Department of Defense an opportunity to communicate with key suppliers on global acquisition reform initiatives. This memorandum expands existing policy on SPI to provide guidance on the Department's relationship with Corporate Councils.

Empowerment of the DoD component representatives, who interface with the Corporate Council, by the Component Acquisition Executive and establishment of a charter is critical. Corporate Councils provide an interface between company representatives and senior component, Office of the Secretary of Defense, Defense Contract Management Command, Defense Contract Audit Agency, and, in some cases, National Aeronautics and Space Administration and Federal Aviation Administration representatives.

The corporate block change process depicted in the attached narrative and flowchart is built on existing SPI authority and designates the Defense Contract Management Command as the Department of Defense lead to implement this process. The goal of this process is to accelerate the rate of acquisition reform across the defense industrial base. Corporate Councils can also facilitate resolution of disagreements, encourage consensus, and elevate and resolve issues. Corporate initiatives can either be SPI proposals or other corporate endeavors designed to achieve efficiencies for the company and ultimately produce savings for the government.

I anticipate Corporate Councils will go a long way toward achieving our goal of civil-military integration. I look forward to your full support for these Councils.

J.S. Gansler

Attachments
As stated

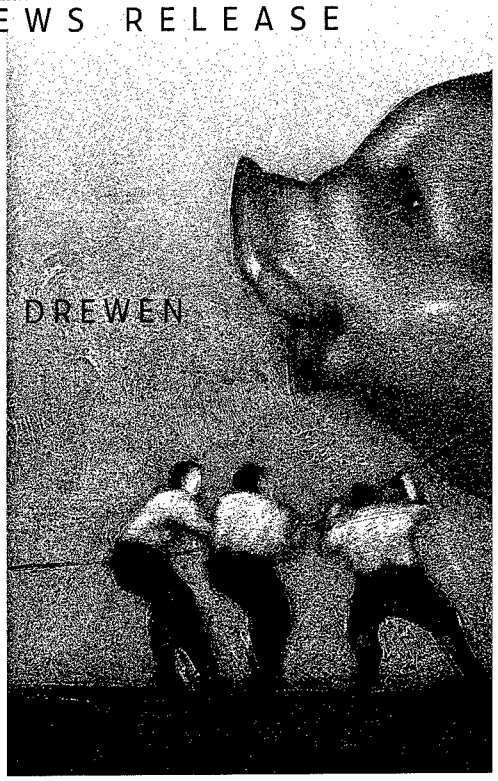
cc:
Administrator, National Aeronautics and Space Administration
Administrator, Federal Aviation Administration

Editor's Note: To download the attachment to this memorandum, go to **http://www.acq.osd.mil/ar/#sat1** on the Defense Acquisition Reform Web site.

U.S. ARMY PUBLIC AFFAIRS NEWS RELEASE

Aberdeen Reverses Outsourcing Decision

GARY SHEFTICK • KAREN JOLLEY DREWEN



WASHINGTON – The decision to award a large part of Aberdeen Proving Ground's [APG] base operations and community support work to a contractor has been reversed.

The initial decision last May to award the work to a contractor meant 558 APG garrison positions would have been eliminated, officials said. Aberdeen Technical Services – a joint venture between DynCorp, Roy F. Weston, and several subcontractors – had been selected as the most cost-effective organization to perform the work under bid, which included public works, logistics, childcare, and community services.

Following an appeals process, though, officials said revised cost estimates changed the initial decision to an in-house government win, by a margin of almost $1.8 million.

Aberdeen was the first Army installation to initiate a garrison-wide Commercial Activities [CA] study, beginning the process in April 1997. Such studies, also known as A-76, are now being conducted at many other installations, according to Col. Duane Brandt, chief of the Competitive Sourcing Office under the Army's Assistant Chief of Staff for Installation Management.

Brandt said a total of 170 Army A-76 studies are now under way, involving about 37,000 jobs. He said many of the studies, though, are "small-scale in terms of functions" and number of jobs under review for outsourcing.

Large garrison-wide studies, Brandt said, are now ongoing at 12 Army installations: Forts Belvoir and Myer in Virginia; Forts Meade, Detrick, and APG in Maryland; Fort Sam Houston, Texas; Fort Polk, La.; Fort Devens, Mass.; Fort Hamilton and Watervliet Arsenal in New York; Pine Bluff Arsenal, Ark; and Rock Island Arsenal, Ill.

Brandt said historially about 50 percent of past CA studies have been contract wins. The larger studies, though, have tended to go in favor of contractors, he said.

Contractors have greater interest in the larger studies such as Aberdeen, Brandt said, because there's "more opportunity for return on investment."

Brandt said reversal of the decision at Aberdeen "gives credibility to the appeals process." He said it shows that the process is not just a rubber stamp, but warned that the contractor will now have a chance to also file appeals.

"This is no more of a sure thing than the announcement I made three months ago on the contractor win," said APG Garrison Commander Col. Robert J. Spidel when he announced the decision to Aberdeen employees last week. He cautioned the workforce to accept the information "without adding assumptions or jumping to conclusions."

As part of the CA process, a public review period was opened after the initial decision, and five appeals against the cost comparison were received. Three were submitted by government employees, one was submitted by Lodge 2424 of the International Association of Machinists and Aerospace Workers, and one was submitted by ATS.

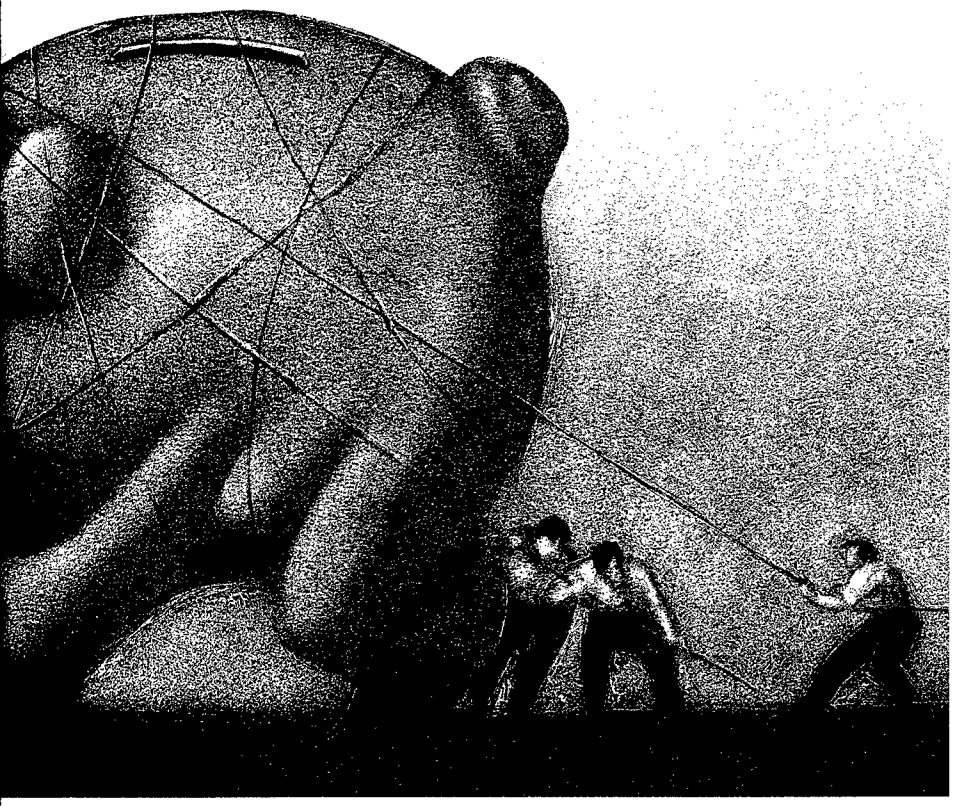
An Administrative Appeals Board convened to review the appeals and determine the validity of the submitted allegations. Of the 37 allegations submitted in the five appeals, nine were upheld. In implementing the decision of the Administrative Appeals Board, made up of representatives from other installations, the government conducted a revised cost comparison, which resulted in a change to the initial decision, and an in-house government win.

Post officials said previous plans, which called for full implementation of a contract or the government's "Most-Efficient Organization" by January 2000, will be delayed because of the reversed dcision and any further time needed to resolve future protests.

Even if the decision in favor [of] the government holds, officials said the current APG workforce will be reduced by 133 positions to meet requirements of the "Most-Efficient Organization" or MEO.

To achieve the reduction, programs such as the Voluntary Early Retirement Au-

Released Sept. 20, 1999



thority, Voluntary Separation Incentive Pay, and Reduction-In-Force will be requested. Spidel said the number of employees that will be displaced cannot be determined until a final decision is reached and VERA, VSIP and RIF are implemented.

A protest period must now be opened in which the contractor may protest the Appeals Board's decision. Spidel noted that there could be lengthy litigation regarding this decision in federal court, which would mean the final outcome of this CA package may not be determined for some time to come.

For the time being, however, those who filed the appeals said the decision is a major victory. Henry L. Scott, business representative for Lodge 2424, said the union was "overwhelmed with the success."

"It's a victory we're going to savor," he said. "However, we're facing the prospect that the contractor can have this overturned."

He thanked the team members who had 21 days to prepare a total of 25 allegations submitted for appeal, who "worked very hard to get it right." Seven of the nine appeals upheld by the board came from the union.

In particular, Scott noted the "outstanding support" of U.S. Rep. Robert Ehrlich Jr., and the assistance from Sen. Paul Sarbanes and Sen. Barbara Mikulski.

Scott noted that problems in the relatively new CA process, also known as A-76, make the process difficult.

"How is a playing field ever going to be level when the contractor has our numbers and we don't have his?" Scott said of his concern that while the contractor has access to government figures, the government CA team cannot see the contractor's package.

Despite the uncertainties of the process, some APG garrison personnel are cautiously optimistic.

Harry Greveris, civilian deputy of the Directorate of Public Works, which has the most employees affected by the package, said DPW employees are more optimistic and will have an easier time planning their futures.

"I think they were pleased to hear it was overturned. Now the biggest challenge will be to make this work, and transition into it," he said.

Ernie Flynn, a DPW facility maintenance and management specialist in the Edgewood Area, said he thinks "there are a lot of questions to be answered.

"I believe there was a sigh of relief, but I believe basically, the workforce as a whole is still holding its breath about the continued uncertainty of what those decisions will be," said Flynn, an APG employee for 27 years. "The real thing is wait and see. This is a step in the right direction, but not the final step."

Randy Moore, chief of the Community Recreation Division in the Directorate of Community and Family Activities, said the news was "a positive decision for both our workforce and our customers." His division's sports program and the Autocraft Program were included in the study.

"I'm not trying to read too much into it, and it's certainly not a final decision, but it certainly is encouraging," he said after the announcement. "There may still be some pain in the transition, but not nearly as much as there would have been with an award to the contractor. But we will wait to see what the final decision is."

Diane Spampinato of the Directorate of Resource Management has supported DPW's resource management needs for 11 years, and has spent more than two years working on the directorate's CA package.

"We're optimistic, because this is just one more step in the right direction to save these people's jobs," she said.

Editor's Note: Drewen is editor of the *APG News*, Aberdeen Proving Ground's weekly newspaper. This information is in the public domain at **http://www.dtic.mil/armylink/new**.

South Korea, Australia, United States Sponsor Pacific Seminar

Cooperation Among Allies

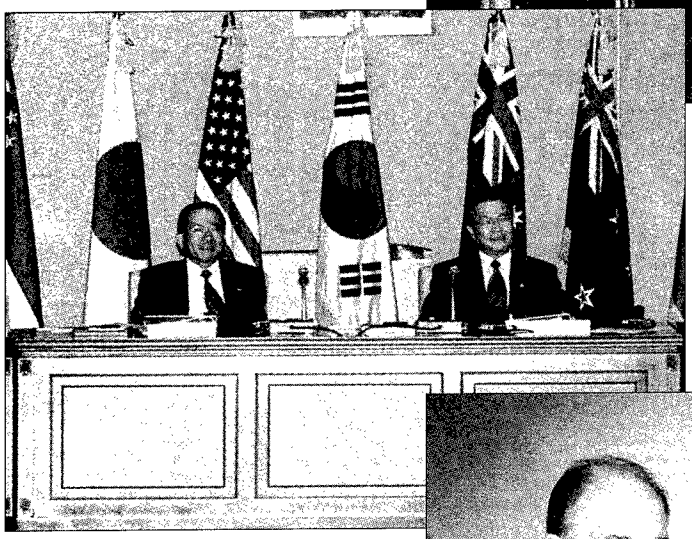
RICHARD KWATNOSKI

The Korean Institute for Defense Analyses (KIDA) hosted the Second Annual International Acquisition/Procurement Seminar – Pacific, Sept. 14-17 in Seoul, South Korea. KIDA, along with the Australian Defence Force Academy (ADFA) and the Defense Systems Management College, sponsored the annual seminar. Over 150 government and industry participants attended – a 20-percent increase over the Inaugural Pacific Seminar hosted last year by ADFA in Canberra, Australia.

While participants were predominantly South Korean and American, representatives also came from the Pacific nations of Australia, New Zealand, Singapore, and Japan, as well as embassy representation from France, Germany, Poland, Russia, and the United Kingdom. U.S. Defense industry provided significant participation, with familiar corporate names on the roster like Boeing, Litton, Northrop Grumman, Sikorsky, and United Defense. South Korea also provided some well-known corporate participation from Samsung, Daewoo, and Hyundai, along with Celsius from Australia, and British Aerospace and GEC Marconi from the United Kingdom.

Lt. Gen. (Ret.) Chang-Kyu Jang, President of KIDA, provided welcoming remarks to the seminar participants, fol-

SEMINAR WELCOMING REMARKS DELIVERED BY PRESIDENT CHANG-KYU JANG, KIDA



FROM LEFT: PRESIDENT CHANG-KYU JANG, KIDA AND YONG-OK PARK, VICE MINISTER OF NATIONAL DEFENSE, MND, BEGINNING KEYNOTE ADDRESS.

FROM LEFT: SEMINAR CO-DIRECTOR RICHARD KWATNOSKI, DSMC, CONFERS WITH SEMINAR MANAGER, DR. NAMHOON CHO.

Kwatnoski *is the Director, International Acquisition Courses, Executive and International Department, School of Program Management Division, DSMC.*

FROM LEFT: SEMINAR CO-DIRECTOR, RICHARD KWATNOSKI, DSMC, CONFERS WITH FUTURE SEMINAR HOSTS, CHINNIAH MANOHARA, DIRECTOR, DEFENCE PROCUREMENT DIVISION, MINISTRY OF DEFENCE, SINGAPORE; AND ROBIN JOHANSEN, DEPUTY SECRETARY OF DEFENCE: ACQUISITION, MINISTRY OF DEFENCE, NEW ZEALAND.

SEMINAR PARTICIPANTS VISITING THE DEMILITARIZED ZONE (DMZ) SEPARATING NORTH AND SOUTH KOREA. FRONT ROW, FROM LEFT: CHINNIAH MANOHARA, DIRECTOR, DEFENCE PROCUREMENT DIVISION, MINISTRY OF DEFENCE, SINGAPORE; ROBIN V. JOHANSEN, DEPUTY SECRETARY OF DEFENCE: ACQUISITION, MINISTRY OF DEFENCE, NEW ZEALAND; AIR FORCE BRIG. GEN. FRANK J. ANDERSON JR., DSMC COMMANDANT; DR. NAM HOON CHO, SEMINAR MANAGER; TONY KAUSAL, AIR FORCE CHAIR, DSMC. BACK ROW, FROM LEFT: GIL WATTERS, DIRECTOR GENERAL, ACQUISITION FINANCE AND REPORTING, DEPARTMENT OF DEFENCE, AUSTRALIA; AIR FORCE MAJ. REBECCA WEIRICK, EXECUTIVE OFFICER TO DSMC COMMANDANT; DR. STEFAN MARKOWSKI, AUSTRALIAN DEFENCE FORCE ACADEMY; RICHARD KWATNOSKI, SEMINAR CO-CHAIR.

FRONT ROW, SEATED FROM LEFT: SEMINAR PARTICIPANTS – GIL WATTERS, DIRECTOR GENERAL, ACQUISITION FINANCE AND REPORTING, DEPARTMENT OF DEFENCE, AUSTRALIA; DR. NARUHIKO UEDA, LT. GEN. (RET.), SENIOR EXECUTIVE DIRECTOR, JAPAN DEFENSE RESEARCH CENTER, JAPAN; HAENG-JUNG KANG, DIRECTOR GENERAL, INTERNATIONAL PROGRAMS BUREAU, MINISTRY OF NATIONAL DEFENSE, KOREA; AND DR. STEFAN MARKOWSKI, AUSTRALIAN DEFENCE FORCE ACADEMY.

lowed by Yong-Ok Park, Vice Minister of National Defense, Republic of Korea (ROK), who delivered the keynote address on "New Acquisition Environment and ROK Defense Acquisition Policy." Vice Minister Park addressed five major policy directions for acquisition.

- Improve the capability to develop military science and technology.
- Pursue efficient and economic acquisition projects.
- Strengthen overall military power through system integration and weapon system capability improvement.
- Pursue acquisition projects linked to the national economic policy.
- Enhance efficiency, professionalism, and transparency in acquisition.

The Vice Minister stressed that the Korean "Ministry of National Defense will pursue active and close international cooperation, especially with the countries in the Pacific Region...."

Haeng-Jung Kang, the Director General of the International Programs Bureau, expanded upon the Korean view and approach to international cooperation in acquisition. Kang holds the distinction of being the first International Chair, DSMC, a position instituted in 1998.

Acting Deputy Under Secretary of Defense for International Programs, Al Volkman delivered the U.S. National presentation, entitled "Priority Acquisition Goals and International Armaments Co-

Photos courtesy KIDA and Anthony "Tony" Kausal

operation." Covering the topics of Coalition Warfare, Globalization, and the Revolution in Business Affairs, he stressed that global leadership and engagement are core principles of U.S. National Security Strategy. Representatives from Australia, New Zealand, Singapore, and Japan also provided National presentations. Numerous presentations also came from U.S., Korean, Australian, and British defense industry representatives.

Additional U.S. DoD presentations included "Preparing for Tomorrow: Revolution in Logistics in the Pacific" by Army Brig. Gen. Phillip M. Mattox, U.S. Pacific Command; "FMS Reinvention" by Edward Ross, Defense Security Cooperation Agency; "ROK-US Acquisition/Procurement Cooperation" by Army Col. Eric Crabtree, JUSMAG-Korea; and "International Negotiations: The Legal Baggage" by Ronald Neubauer, Office of the General Counsel, OSD.

Following three days of presentations, the fourth day of the seminar featured an optional trip to the Demilitarized Zone (DMZ) separating North and South Korea. The grim reality of the DMZ brought the need for seminars about cooperation among allies into sharp focus.

DSMC played a key role in the seminar. The new Commandant of DSMC, Air Force Brig. Gen. Frank J. Anderson, gave a presentation on U.S. Acquisition Reform; Anthony "Tony" Kausal delivered a presentation on Comparative Acquisition/Procurement Practices of the Pacific Nations; and DSMC Professor and Course Director, Richard Kwatnoski co-chaired the seminar along with Dr. Dong Joon Hwang, Vice President of KIDA.

Future Seminars

The Third International Acquisition/Procurement Seminar - Pacific will be hosted by Singapore in September. The Fourth Pacific Seminar is to be hosted by New Zealand, with the United States hosting the year following.

Editor's Note: *Program Manager* readers are encouraged to visit the DSMC international acquisition education Web site for seminar updates at **http://www.dsmc.dsm.mil/international/international_pac.htm.**

Garber Appointed Pentagon's New Director, Interoperability

Dr. Vitalij "V" Garber was appointed the Director, Interoperability, Office of the Under Secretary of Defense (Acquisition & Technology) July 19. Previous to his appointment, Garber served as Chief Executive Officer of GIA (Garber International Associates, Inc.), which he founded in December 1983. Throughout his career, Garber founded several successful companies, where he gained extensive industrial experience in forming international partnerships and joint ventures. In addition, he served on many Defense Science Board task forces dealing with future operations and interoperability.

From January 1981 through November 1983, Garber was the Assistant Secretary General of the North Atlantic Treaty Organization (NATO) for Defense Support. Serving as the permanent Chairman of the Conference of National Armaments Directors and the Senior NATO C2 (Command and Control) Committee, he was responsible for promoting cooperation among nations in harmonizing the concepts and requirements for future equipment; coordinating procurement and replacement plans; and identifying priorities.

From December 1977 to January 1981, Garber was the Deputy Under Secretary of Defense for International Programs and Technology, managing all Department of Defense international activities in research, development, and acquisition.

From May 1975 to December 1977, Garber was the Technical Director and Deputy Assistant Administrator for field operations, with the Energy Research and Development Administration (ERDA), now the U.S. Department of Energy. He was responsible for oversight of the National Laboratories (Brookhaven, Argonne, Los Alamos, Livermore, Berkley, and others), working to establish technological centers of excellence and effective project management.

From March 1971 to May 1975, Garber was Advisor for Developments, Department of the Army, concerned with the full spectrum of science, technology, and engineering, and advising on the development of future Army systems.

For three years before joining the Department of the Army, Garber was with the Stanford Research Institute (SRI) where he was Assistant Director of the Systems Research Department, heading systems effectiveness and technology assessment studies. He was also responsible for all SRI work in support of future ballistic missile defense.

Garber received his bachelor's and master's degrees in Physics from the University of Minnesota (1959 and 1962); a Ph.D. from the University of Alabama (1966); and performed postdoctoral work at Harvard University (1966-67). He served as an officer in the U.S. Army, completing the U.S. Army Infantry Officer Leadership, Airborne, and Armor Officer Career Courses. Following his military service, Garber joined the Army Missile Command Laboratories in Huntsville, Ala., where he specialized in optimum control theory.

SECTION 912(C) STUDIES DATA WAREHOUSE

Section 912(c) of the National Defense Authorization Act for Fiscal Year 1998 directs the Secretary of Defense to submit to Congress an implementation plan to streamline the acquisition organizations, workforce, and infrastructure. Secretary of Defense William Cohen presented his Section 912 Report to Congress April 1, 1998. In the report, Cohen laid out the Department's actions to accelerate the movement to the new workforce vision.

To achieve the DoD vision, several groups were chartered to study specific initiatives in the report. Some of the groups' findings are now posted to the Deputy Under Secretary of Defense (Acquisition Reform) Web site at **http://www.acq.osd.mil/ar/section912.htm.**

1.1 — RDT&E Infrastructure

- Excerpt from Section 1.1 — Cohen's April '98 Report to Congress
- Charter — Development of an Implementation Plan to Streamline Science & Technology, Engineering, and Test and Evaluation Infrastructure, Aug. 20, 1998
- Report — Final RDT&E Infrastructure Report, July 9, 1999
- Letters to Congress — Accompanying Final Report

1.2 — C3 Integration/Acquisition

- Excerpt from Section 1.2 — Cohen's April '98 Report to Congress
- Charter — Establishment of a Joint Command & Control Integration/Interoperability Group, 23 October 1998

2.1 — Product Support

- Excerpt from Section 2.1 — Cohen's April '98 Report to Congress
- Charter — Establishment of a Study Group to Implement Reengineered Product Support Practices within the DoD, Sept. 17, 1998
- Report — Final Report of the Product Support Study Group, July 1999
- Memo — Transmittal Memo accompanying Final Report, July 1999

2.4 — PM Life Cycle Management

- Excerpt from Section 2.4 — Cohen's April '98 Report to Congress
- Charter — Establishment of a Study Group on PM Oversight of Life Cycle Support, Aug. 28, 1998
- Acquisition Policy — Title VIII, Section 816
- Report — Section 816 Report to Congress, Feb. 3, 1999

3.1 — Training for Service Contracting

- Excerpt from Section 3.1 — Cohen's April '98 Report to Congress
- Charter — Review Acquisition Workforce Training Processes & Tools for Service Contracts, Oct. 19, 1998

3.2 — Continuous Learning

- Excerpt from Section 3.2 — Cohen's April '98 Report to Congress
- Policy for Continuous Learning for the Defense Acquisition Workforce, Dec. 15, 1999

3.3 — Training for Commercial Business Environment

- Excerpt from Section 3.3 — Cohen's April '98 Report to Congress
- Charter — Commercial Business Environment Training Team, Nov. 12, 1998

3.4 — Technical Workforce Requirement &

- Excerpt from Section 3.4 — Cohen's April '98 Report to Congress
- Charter — Development of an Implementation Plan to Recruit, Develop, Reward & Retain Technology Leaders, Sept. 22, 1998

3.5 — Future Acquisition & Technology Workforce

- Excerpt from Section 3.5 — Cohen's April '98 Report to Congress
- Charter — Future A&T Workforce Study Group, Aug. 25, 1999

5.1 — Price-Based Acquisition

- Excerpt from Section 5.1 — Cohen's April '98 Report to Congress
- Charter — Establishment of a Study Group to Analyze Implementation of Price-Based Acquisition within the DoD, Oct. 15, 1998
- Study — The Potential Impact of Price-Based Acquisition: Identifying Targets for Reform, Jul. 26, 1999

Requirements/Acquisition

- Charter — Establishment of an Oversight & Steering Group to Review the Adequacy of the Requirements Generation System to Fulfill Current & Future Acquisition Needs of the Department, Nov. 16, 1998
- Report — Requirements & Acquisition Final Report, Aug. 2, 1999
- Policy Memo — Implementing Requirements Generation & Acquisition, July 14, 1999
- Policy Memo — Implementing Cycle Time Reduction Recommendations, July 8, 1999

Editor's Note: This information, published by the Office of the Deputy Under Secretary of Defense (Acquisition Reform) is in the public domain at **http://www.acq.osd.mil/ar/section912.htm**.

IG Eagle Look

You Can Improve Acquisition Processes At *No Cost* to Your Program

COL. ANTHONY R. JOHNSON, U.S. AIR FORCE
RETHA A. SHERIDAN • MELISSA C. STRATTON

Should you get excited about an Inspector General (IG) Eagle Look? *Yes*! An IG Eagle Look allows you the opportunity to influence future Air Force policies and processes. Formerly known as a Management Review, an Eagle Look is a fact-based management review, conducted by trained inspectors who evaluate Air Force-wide processes and provide senior Air Force leaders recommendations for improvement.

What is AFIA All About?

When we arrived at the Air Force Inspection Agency, Acquisition Inspection Directorate, Kirtland AFB, N.M. – one of us last year, and the other two about nine years ago – each of us initially knew little about the organization. And certainly not enough to feel confident in our understanding of what AFIA is, what AFIA does, and how AFIA accomplishes its mission. Now that we have come to understand AFIA's role and its importance to the Air Force acquisition community, we believe that sharing that knowledge is not only an opportunity but an imperative.

In this article, we focus on AFIA's organizational mission, a description of associated acquisition assessment processes, and AFIA's overall role in promoting acquisition reform and all it embodies throughout the Air Force.

Inspections and Eagle Looks

The mission of The Inspector General is to independently assess the readiness, discipline, and efficiency of the Air Force. Our mission at AFIA is to provide Air Force leaders with independent and objective assessments to improve Air Force operations and support (Figure 1). AFIA is the *only* IG organization chartered to provide Air Force-wide systemic reviews of policies and processes. For process owners and stakeholders, we address issues requested by senior Air Force leaders. To ensure our reviews remain objective, factual, and professional, we aggressively pursue three basic tenets highlighted by The Inspector General:

- **Identity** – Ensure our customers know who we are and how we operate.
- **Credibility** – Ensure we base our conclusions and recommendations on factual information and sound analysis.
- **Relevancy** – Ensure the subjects we review are significant to the Air Force.

The Acquisition Inspection Directorate's mission is to provide independent assessments (Eagle Looks) of acquisition and sustainment processes for senior Air Force acquisition leaders. As such, AFIA conducts reviews throughout the world for a variety of customers, covering a broad range of issues

Johnson *is the Chief, Systems Inspection, Headquarters, Air Force Inspection Agency, Acquisition Inspection Directorate (AFIA/AI), Kirtland AFB, N.M. He is a graduate of PMC 92-2, DSMC.* ***Sheridan*** *is the Administrative Officer and* ***Stratton*** *the Editorial Assistant, AFIA/AI.*

across the total acquisition life cycle (from requirements through sustainment to disposal).

A typical acquisition Eagle Look will take about four and a half months from the time we begin studying a subject until we outbrief senior Air Force leadership with our results. We conduct our Eagle Looks on a two-cycle schedule, usually accomplishing three per cycle or six per year.

Topic Selection

Topics originate from a variety of sources. The Inspector General and AFIA solicit topics through Air Force-wide topic calls during August and February. Although anyone can submit topics at anytime, The Inspector General can also direct topics. (The AFIA Web site at **http://www-afia.saia.af.mil** includes a description of the format [shown on this page] and instructions on how to submit a topic for consideration.) After validation, topics are presented to senior Air Force leaders in January and July, who prioritize and forward them to The Inspector General for approval. Topics remaining from their meetings that were not reviewed during inspection cycles, as well as any new topics received, are then reprioritized at the next meeting.

AFIA compares and deconflicts its topics with representatives of several organizations. Though not all-inclusive, a typical list follows:

- Air Force Audit Agency
- Air Force Logistics Management Agency
- Headquarters Air Force Materiel Command Inspector General
- Army Materiel Command
- Defense Logistics Agency
- Department of Defense Inspector General
- General Accounting Office
- Other Service Inspector General organizations and audit agencies.

Scope

The first step of the Eagle Look process begins by discussing the topic with stakeholders and process owners (Figure 2). This establishes the focus or scope of

Format for Eagle Look Topic Proposal

TOPIC TITLE
Title, process, or program to be assessed.

PURPOSE
State specific result that the effort should address, what question(s) does the process/program owner want answered?

BACKGROUND
Give a brief history of the issue and Air Force leaderships' interest in AFIA conducting this review. Include the results of initial research (if any), other staff work, and any metrics or other indicators that help describe the background and frame the issue. If this issue has been previously assessed by AFIA, Air Force Audit Agency, the General Accounting Office, or any other agency, please identify the agency and the date.

SCOPE
The parameters of the area to be assessed.

FOCUS
Where should the review focus its look?

Breadth
Describe the breadth of the problem in terms of how far across the Air Force the topic applies. To what depth should the review go? Is the topic DoD-wide or major command-specific? Is it cross functional or functionally specific? Please be specific.

Methodology
Is there a specific methodology recommended for gathering topic information? Are there any specific boundaries that apply to the conduct of the review?

RATIONALE

Significance
Describe the seriousness of the problem or the size of the issue. If possible, quantify it in dollars, personnel, manhours, percentages, etc. Again, please be specific.

Timing
State when you need the final report and the associated rationale.

POINT OF CONTACT
Provide action officer's name, office symbol, DSN, and E-mail address.

FIGURE 1. **Where AFIA "Fits" in the Inspector General (IG) System**

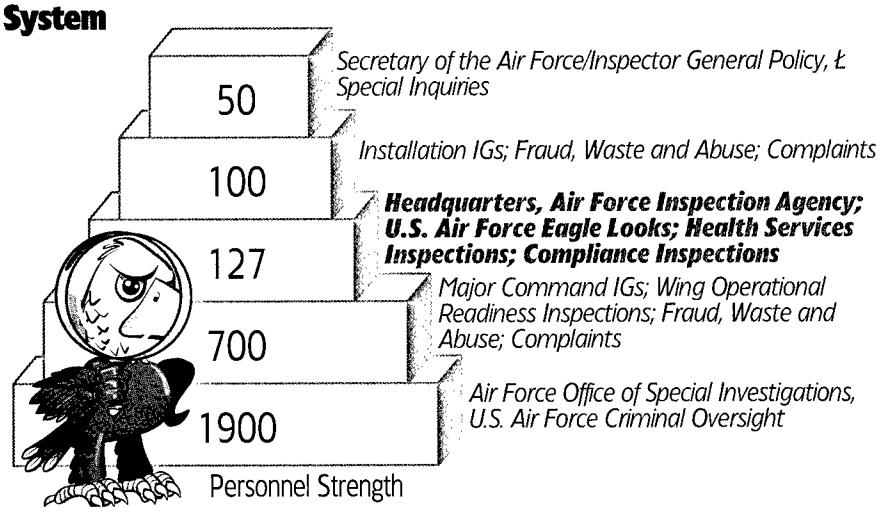
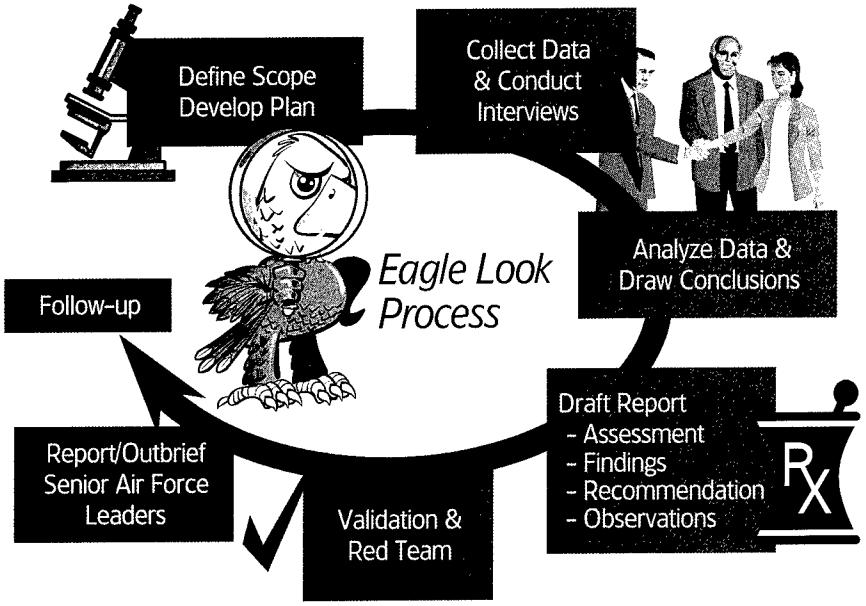


FIGURE 2. **Eagle Look Process**



the review and determines how the team will conduct their data gathering. Determining the scope also entails initial discussions on what type of follow-up activities would be appropriate for the review. Discussions on follow-up continue throughout the review and are finalized with stakeholder concurrence at the end of the review.

Collect and Analyze Data

Our goal is to obtain facts as well as candid opinions on the process under review, while minimizing the amount of time that we ask of an organization. For that reason, we generally do not distribute questions before our visits to avoid staffed responses and minimize advance preparations. We give people an opportunity to express *their* ideas on how to remove barriers, improve processes, and better perform their jobs. (Note that information referenced in an Eagle Look report is not attributed to a specific person, program or agency. We typically report, "Five of 13 organizations interviewed said ..." rather than, "Captain Smith from XX Wing at Anywhere AFB said." This complements our policy of nonattribution and provides all interviewees anonymity. Specific individuals, programs, or organizations are only mentioned if we believe their activities qualify as a best practice other organizations may want to consider emulating.)

After we collect and analyze the data, we write the draft report. Interviewees and a select group of subject matter experts, referred to as the "Red Team," representing the process owner(s) validate the report. Once we brief senior leadership and publish the report, the Eagle Look process is considered complete. AFIA periodically follows up with process owners on the status of actions to address the Findings and Recommendations in the Eagle Look report.

Impact of recent Eagle Looks includes changes to doctrine and policy; additional training and education opportunities; and increased efficiencies to standard practices. Some of the newly released *Lightning Bolts 99* are attributable to AFIA reviews. The recommendations derived from these reviews were the result of personnel, at all levels, influencing future Air Force and, sometimes, Department of Defense processes and policies

What Have We Been Doing Lately?

We recently reviewed such acquisition initiatives as:

- Chief Information Officer Function
- Program Management Administration Funding
- Common Avionics System Management
- Human Systems Integration in Air Force Acquisition
- Test and Evaluation Software-Intensive Systems
- Contractor Support and Essential Services During Wartime and Operational Contingencies
- Commercial Aircraft Industry Best Practices
- Commercial and Non-Developmental Item Aircraft
- Acquisition Reform
- Lean Logistics
- Integrated Weapon System Management
- Aging Weapon Systems
- Operations and Support Cost Estimating.

We can assess areas for improvement and share best practices, at *no cost* to your program. The goal is to build a consensus with the stakeholders to implement useful, actionable recommendations. Moreover, we offer a timely, concise, objective, and independent assessment of Air Force-level systemic processes. So again, to answer the question "Should you get excited about an IG Eagle Look?" *Of course!*

Editor's Note: For a complete listing and synopsis of AFIA/AI's assessments since 1995, visit their Web site at **http://www-afia.saia.af.mil**. The authors welcome questions or comments. Call, write, or send an E-mail to:

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THE DEFENSE ACQUISITION UNIVERSITY

CALL FOR PROPOSALS

Proposals are solicited for the tracks specified below. Areas include:

- Educational Technologies
- Educational Methodologies
- Staff and Administrative Issues
- Instructional Delivery
- Assessment
- Evaluation
- Professional Development
- Technical Subject Matter in all defense acquisition subject areas such as contracting, engineering, logistics, production, and quality management.

NOTE: This list should not be considered all-inclusive. Other topics and areas related to the DAU mission would be considered and welcomed.

Fax or mail your proposal to:

DEFENSE ACQUISITION UNIVERSITY
2001 NORTH BEAUREGARD ST RM 740
ATTN: NORLINE DEPEIZA
ALEXANDRIA VA 22311-1772

Or, E-mail your proposal to:

DEPEIZN@acq.osd.mil

If sending the proposal as an electronic attachment, please name it as follows:

Yourname_topic.doc

DAU Beyond 2000 Conference

The Defense Acquisition University (DAU) invites you to submit proposals as a Session Leader at the *"DAU Beyond 2000: Excelling @ the Speed of Change"* conference to be held at the University of Maryland Conference Center in College Park, Maryland, Nov. 14-17, 2000. The sessions may be a workshop, academic paper and presentation, presentation/discussion, panel, demonstration, etc.

The following information should be provided in your proposal application

Name and Title

Activity/Organization

Mailing Address
City **State** **Zip Code**

Phone Number **Fax Number**
E-mail

Title of presentation or paper

Abstract (Please limit to 250 Words)

Deadline: Feb. 29, 2000

The Acquisition Chart

A Road Map for Use by Program Managers Throughout the System Life Cycle

PAUL MCILVAINE

The increase in complexity of defense systems, coupled with rapid technological progress, requires the use of functional specialists who understand the technology, advocate "best practices," and execute necessary actions within the framework of their specific discipline. Concurrently, the need for interdisciplinary managers [a.k.a., generalists] to "integrate" the technology and "tie together" the efforts of these specialists toward common objectives remains just as great.

The Department of Defense has addressed this challenge by the use of the program manager — a single individual responsible for a defense system, supported by cross-functional teams composed of specialists and generalists. These teams are known as Integrated Product Teams (IPT). The best way to model this interaction is in the form of a matrix.

Intermediate groupings of functional specialists can assist in tying the technology together and facilitating smoother integration. Elvin Isgrig, in his 1984 study, "Integration: An Interdisciplinary Study of Project/Program Management," identified three intermediate groupings of specialists. Technical groupings generally consist of systems engineering; software; test and evaluation; manufacturing and production; and acquisition logistics. Business groupings usually consist of contract management and funds management. Administrative groupings can be expected to include acquisition policy; program management and leadership; and earned value management. Technical, business, and administrative managers are the key linkages between the functional specialists and generalists. Many program management offices organize themselves along the lines of these groupings.

A good analogy is that of an orchestra. Functional specialists who play violins, viola, and cello make up the intermediate grouping known as the string section. Add the woodwinds, brass, percussion, and horns; you then have all the components necessary to make up an orchestra. The score (Program Management Plan or Single Acquisition Management Plan) represents the common objective of each "player." The "concertmaster or first chair of violins" [for example] performs "intermediate integration" of the violin section in support of the conductor. The conductor (or program manager) is responsible for overall integration of the efforts of each player and section. He or she strives to develop ensemble by working as a team to appropriately interpret the score. The measure of the orchestra (or how well the system performs) is in the harmony and synchronization of each element that performs "as one."

The Defense Systems Acquisition Management Process Chart ("The Acquisition Chart") is now in its Eighth Edition and serves as a pictorial training aid, visually depicting the policy guidelines in the DoD 5000 series of documents [coupled with "best practices"].

The rows represent the functional specialists who follow the process outlined for their specific discipline. The columns represent the total effort underway at each point in a program, and how the generalists attempt to "tie together" or "integrate" the ongoing work of the functional specialists. The entire overall process is known as Integrated Product and Process Development (IPPD). In practice, IPPD development is accomplished by multiple IPTs.

"The Acquisition Chart" depicts the entire life cycle ("cradle to grave") of a nominal defense acquisition program. To optimize the overall system, program managers must understand the contributions of the functional specialists (rows) within the integrating framework of the generalists (columns). Thus, "The Acquisition Chart" serves as not only a road map for program managers to use throughout the system life cycle, but also a training aid/template from which to design a "real world" course in program management.

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Editor's Note: A smaller version of "The Acquisition Chart" appears on the following four pages. Also, another smaller version of the chart can be downloaded and printed from the DSMC Home Page in Acrobat as a PDF file. To download, go to **http://www.dsmc.dsm.mil/pubs/chart3000/ch_3000.htm** on the DSMC Web site.

McIlvaine *is currently a Professor of Engineering Management, Logistics Management Department, Faculty Division, DSMC. A Project Leader for eight versions of the Acquisition chart, over 100,000 copies have been distributed since the chart's inception in 1984. The author wishes to acknowledge* ***Maestro Ernest Green****, Conductor, Annapolis Chorale and Chamber Orchestra, for his assistance in preparing this article.*

The Defense Systems Acquisition Management Process Chart

HOW TO OBTAIN COPIES

Military and government employees can obtain a single copy of this chart from the Publications Distribution Center in the basement of building 204 at the Ft. Belvoir Campus. A written request is needed for nonstudent requests. Please send requests to DSMC, ATTN ASCL, 9820 Belvoir Road, Suite 3, Ft Belvoir, VA 22060-5565 or fax to (703) 805-3726. Multiple copies requested by government personnel must be purchased through the Government Printing Office (GPO). Nongovernment personnel must purchase one or more copies through GPO.

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I. INTRODUCTION

DSMC POC: Paul McIlvaine; FD-LM; (703) 805-4660

The Defense Systems Acquisition Management Process Chart is a training aid for Defense Systems Management College (DSMC) Courses and is designed to serve as a pictorial roadmap of functional activities throughout the Defense Systems Acquisition Life Cycle. This chart is based on the policies in Department of Defense (DoD) 5000 Series documents. These consist of DoD Directive (DoDD) 5000.1, as modified by change 1, *Defense Acquisition*, and DoD Regulation 5000.2-R, *Mandatory Procedures for Major Defense Acquisition Program (MDAPs) and Major Automated Information System (MAIS) Acquisition Programs*, as modified by changes 1-4 (inclusive). The *Defense Acquisition Deskbook* describes discretionary information and best practices in implementing defense acquisition. This chart is ***not a*** substitute for knowing these references.

Acquisition of a system is a process that begins with the identification of a need; encompasses the activities of design, test, manufacture, operations and support; may involve modifications; and ends with the disposal/recycling/demilitarization of that system. Upgrade (or modification) programs also follow the acquisition life cycle that includes the activities of design, test, manufacture, installation and checkout, and operations and support.

The primary objective of defense acquisition, stated in DoDD 5000.1, is to acquire quality products that satisfy the needs of the operational user with measurable improvements to mission accomplishment, in a timely manner, at a fair and reasonable price. Several important themes, promoted in the latest versions of these acquisition documents and in ongoing Acquisition Reform efforts, are teamwork, tailoring, empowerment, cost as an independent variable (CAIV), commercial products, and best practices. Additional goals imposed on the DoD acquisition process include political, ethical, and economic goals.

To implement these varied themes and goals, many unique requirements, laws, and regulations are imposed on defense acquisition that still burden program managers in pursuing the efficiencies inherent in pure commercial acquisition practice.

DoD components shall first try to satisfy mission needs through nonmateriel solutions, such as changes in doctrine or tactics. If this will not provide the most cost-effective solution over the system's life cycle, the use or modification of systems or equipment that the component already owns is generally more cost effective than acquiring new materiel. If existing U.S. military systems or other on-hand materiel cannot be economically used or modified to meet the operational requirement, an acquisition program may be justified.

This chart provides the basic information needed to understand the Acquisition Life-Cycle Process. For additional information, please use the reference materials indicated above or contact the department point of contact (POC) associated with each section of the chart. Department POCs can detail further their respective section on the chart.

There is no single, approved taxonomy of the functional disciplines and subdisciplines that, taken together, constitute defense systems acquisition. Acquisition career fields have been established under the auspices of DoDD 5000.52 for both military and civilian members of the Defense Acquisition Workforce.

II. ACQUISITION POLICY

DSMC POC: Acquisition Policy Department; FD-AP; (703) 805-5144

The Defense Systems Acquisition Management Process is structured by DoD Regulation 5000.2-R into discrete, logical phases separated by major decision points (called milestones) to provide the basis for comprehensive management and progressive decision making. The number of phases and decision points shall be tailored to meet the specific needs of individual programs.

The documents applicable to a particular program at a specific milestone shall be determined individually for each program through the IPT process and approved by the Milestone Decision Authority (MDA). Figures 1 and 2 contain a list of documents that may be applied.

Acquisition Strategy. A plan that serves as a roadmap for program execution from program initiation through post production support. ACAT I and IA Programs must contain information on: Open Systems Objectives, Sources, Risk Management, CAIV, Contract Approach, Management Approach, Environmental Considerations, Safety and Health Considerations, Modeling and Simulation, Source of Support, Warranties, and Government Property in possession of Contractors.

FIGURE 1. INFORMATION FOR MILESTONE REVIEWS - ACAT I AND ACAT IA PROGRAMS

Information (MDA may waive non-statutory requirements.)	Milestone				Reference	
	0	I	II	III	DoD 5000.2-R	Other
Acquisition Program Baseline (APB)[1]		X	X	X	Part 3.2.2	10 USC 2435
Acquisition Strategy (11 elements)		X	X	X	Part 3.3	
Analysis of Alternatives (AOA)[2]		X	[2]	[2]	Part 2.4	
Acquisition Decision Memorandum (ADM)	X	X	X	X	Part 5.2.1	
Affordability Assessment		X	X	X	Part 2.5.2	DoDD 5000.1
Beyond Low Rate Initial Production (LRIP) Report[3]				X	Part 6.3.3	10 USC 2399
C4I Support Plan		X	X	X	Part 2.2.1	CJCSI 3170.01
Component Cost Analysis (CCA)		X	X	X	Part 5.6	DoDD 5000.4
Consideration of Technological Issues	X	X	X	X	Part 1.4	
Cost Analysis Requirements Description (CARD)		X	X	X	Part 3.5.1	DoDD 5000.4
Exit Criteria	X	X	X	X	Part 3.2.3	
Full Funding of DAB & MAISRC Programs		X	X	X	Part 2.5.1	
Independent Estimate of Life-Cycle Cost		X	X	X	Part 3.5.1	10 USC 2434
Interoperability Certification (C3I Systems)				X		DoDI 4630.8
Live Fire Test & Evaluation Waiver Certification[3]			X		Part 3.4.9	10 USC 2366
Live Fire Test & Evaluation (LFT&E) Report[3]				X	Part 6.3.2	10 USC 2366
Legality of Weapons Under International Law			X	X		DoDD 5000.1
Low Rate Initial Production (LRIP) Quantities[3] Part			X		1.4.4.1	10 USC 2400
Manpower Estimate[3]			X	X	Part 3.5.2	10 USC 2434
Mission Need Statement (MNS)	X				Part 2.3	CJCSI 3170.01
Operational Requirements Document (ORD)		X	X	X	Part 2.3	CJCSI 3170.01
Overarching IPT (OIPT) Leader's Report[4]	X	X	X	X	Part 5.4.1	
OIPT Staff Assessments[4]	X	X	X	X	Part 5.4.1	
Program Office Estimate (POE) (life-cycle costs)		X	X	X	Part 3.5.1	DoDD 5000.4
Provisions for Evaluation of Post Deployment Support		X	X	X	Part 1.5.4	
Requirement for Program Under DoD Strategic Plan	X	X	X	X	Part 1.5	
System Threat Assessment[3]		X	X	X	Part 2.2	
Test & Evaluation Master Plan (TEMP)		X	X	X	Part 3.4.11	10 USC 2399
Test Results (DT&E, OT&E, LFT&E, etc.)			X	X	Part 6.3.1	10 USC 139

[1] Including CAIV based objectives. [2] May be updated for MS II; unlikely to be required at Milestone III.
[3] Normally not applicable to ACAT IA. [4] ACAT ID and ACAT IAM programs only.

FIGURE 2. INFORMATION FOR MILESTONE REVIEWS - ACAT II AND III* PROGRAMS

Information Element (MDA may waive non-statutory requirements.)	Milestone				Reference	
	0	I	II	III	Primary	Other/Related
Acquisition Program Baseline (APB)[1]		X	X	X	DoDD 5000.1, D.3.g	DoD 5000.2-R, 3.2.2
Acquisition Strategy		X	X	X	DoD 5000.2-R, 3.3	
Affordability Assessment		X	X	X	DoDD 5000.1, D.1.a	DoD 5000.2-R, 2.5
C4I Support Plan		X	X	X	DoD 5000.2-R, 2.2.1	CJCSI 3170.01
Environmental Safety & Health (ESH) Assessment[2]		X	X	X	DoD 5000.2-R, 3.3.7	42 USC 4321-47
Interoperability Certification (C3I Systems)				X	DoDI 4630.8	
Legality of Weapons Under International Law			X	X	DoDD 5000.1, D.2	
Life-Cycle Cost Estimate		X	X	X	DoDD 5000.1, D.1.g	DoD 5000.2-R, 3.5.1
Live Fire Test & Evaluation Waiver Certification[3,4]			X		DoD 5000.2-R, 3.4.9	10 USC 2366
Live Fire Test & Evaluation Report[3,4]				X	DoD 5000.2-R, 6.3.2	10 USC 2366
Low Rate Initial Production (LRIP) Quantities[2,3,5]			X		DoD 5000.2-R, 1.4.4.1	
Mission Need Statement (MNS)	X				CJCSI 3170.01	DoD 5000.2-R, 2.3
Operational Requirements Document (ORD)		X	X	X	CJCSI 3170.01	DoD 5000.2-R, 2.3
Risk Assessment[2]		X	X	X	DoDD 5000.1, D.1.d	
Staff Assessments	X	X	X	X	DoDD 5000.1, D.2.g	
Test & Evaluation Master Plan (TEMP)[3]		X	X	X	DoD 5000.2-R, 3.4.11	10 USC 2399
Test Results (DT/OT/LFT&E)[6]			X	X	DoD 5000.2-R, 6.3.1	10 USC 139

MDA's for ACAT II & III* programs have wide latitude and broad authority over the content and format of many (but not all) of these information elements:

1. Including Cost As an Independent Variable (CAIV) based objectives.
2. May be included in PM's acquisition strategy.
3. Normally not required for AIS programs.
4. Programs subject to live fire T&E legislation
5. ACAT II only; however, it is DoD policy to limit LRIP quantities for all ACATs.
6. Programs on OSD T&E Oversight List.

*Army, Navy, and Marine Corps also have an ACAT IV category. The information on this chart may also be tailored for those programs.

Source (Figures 1 & 2): Defense Systems Management College Acquisition Policy Department

III. PROGRAM MANAGEMENT AND LEADERSHIP

DSMC POC: Program Management and Leadership Department; (FD-PML; (703) 805-4985

Fundamental change in the DoD acquisition culture is underway and requires individuals and organizations to change from a hierarchical decision-making process to one where decisions are made across organizational structures by multidisciplinary teams known as Integrated Product Teams (IPTs). Successful PMs must be leaders who can create a vision for their program, translate this into concrete missions, break these down into critical success factors (goals), and nurture and develop (via empowerment and teamwork) the IPT's to successfully execute acquisition programs. Under DoDD 5000.1 and DoD Regulation 5000.2-R, the preferred management technique for use by a PM is known as Integrated Process and Product Development (IPPD). The goals of IPPD are to integrate all acquisition activities starting with requirements definition through production, fielding/deployment, and operational support in order to optimize the design, manufacturing, business, and supportability processes. IPPD is an expansion of concurrent engineering, and it simultaneously integrates all essential acquisition activities through the use of IPTs.

The primary program management activities are as follows:

1.) **Planning**: The first program management planning activity is the development of the acquisition strategy, which lays out how the program will accomplish its objectives in terms of, among others, cost, schedule, performance, risk, and contracting activities. For Milestone decisions, it is included as part of a single document (to the maximum extent practicable). Each program's acquisition strategy is tailored to meet the specific requirements and circumstances of the program. Possible strategies include modifications of existing equipment, use of commercial/nondevelopmental item (NDI), technology demonstration and advanced prototyping, use of preplanned product improvements (P3I), and evolutionary development.

2.) **Organizing & Staffing**: The establishment, organization, and staffing of the program office should be a direct outgrowth of the task analysis, which supports the program's acquisition strategy. As the program evolves, the program office organization and staffing should also evolve to support the changing task requirements and acquisition environment.

3.) **Controlling**: The control system consists of standards against which progress can be measured; a feedback mechanism that provides information to a decision maker; and a means to make corrections either to the actions underway or to the standards. Examples of standards used in the systems acquisition process include the acquisition program baseline (APB), exit criteria, program schedule, program budget, specifications, plans, and test criteria. Examples of feedback mechanisms for program control, oversight, and risk management include Joint Requirements Oversight Council (JROC) and Defense Acquisition Board (DAB) reviews; selected acquisition reports (SAR) and Defense Acquisition Executive Summary (DAES) reports; the Integrated Baseline Review (IBR); the Earned Value Management (EVM) Reports; Contract Funds Status Report (CFSR) charts; the configuration management (CM) process; independent life-cycle cost (LCC) estimates; program and technical reviews; and developmental and operational test and evaluation (D/OT&E).

4.) **Leading**: Effective leadership is the key to program success. It involves developing an organization's mission, vision, and goals, and clearly articulating a set of core values. Dominant leadership roles in program management include strategy setting, consensus/team building, systems integration, and change management. For successful teams, factors such as empowerment, clear purpose, open communication, adequate resources, and a team-behavioral environment are critical.

IV. EARNED VALUE MANAGEMENT

DSMC POC: Earned Value Management Department; (FD-EV); (703) 805-3769

Earned Value Management: The use of an integrated management system to coordinate work scope, schedule, and cost goals and objectively measure progress toward those goals.

Earned Value Management Systems (EVMS): Management standards (for significant dollar threshold contracts) used to evaluate an organization's integrated management systems.

Cost Performance Report (CPR): An objective summary of contract status that includes the following:

Budgeted Cost of Work Scheduled (BCWS) - Value of work scheduled in budget terms
Budgeted Cost of Work Performed (BCWP) - Value of work completed in budget terms
Actual Cost of Work Performed (ACWP) - Cost of work completed

Cost/Schedule Status Report (C/SSR): A reasonably objective summary of contract status in terms of BCWS, BCWP, and ACWP.

Work Breakdown Structure: A product-oriented family tree composed of hardware, software, services, and data, which comprise the entire work effort under a program.

Integrated Baseline Review (IBR): A joint Government/Contractor assessment of the performance measurement baseline (PMB).

V. CONTRACT MANAGEMENT

DSMC POC: Contract Management Department; (FD-CM); (703) 805-3442

Contract Management is the process of systematically planning, organizing, executing, and controlling the mutually binding legal relationship obligating the seller to furnish supplies and/or services and the buyer to pay for them.

Contract: The document that definitizes the government/industry agreement.

A **Draft RFP** and **Presolicitation Conference** are used to ensure that the requirements are understood by industry and that feedback is provided to the government.

Cost Type Contract: A family of cost-reimbursement type contracts, where the government pays the cost (subject to specified limitations) and the contractor provides "best efforts." This type may provide for payment of a fee that may consist of an award fee, incentive fee, or fixed fee.

Engineering Change Proposal (ECP): A formal document used to make engineering changes to configuration management baselines in an existing contract

Firm Fixed Price Contract: A family of fixed-price type contracts where the government pays a price, subject to specified provisions, and the contractor delivers a product or service. This type may provide for payment of incentives or other sharing arrangements.

RFP, SOW/SOO, SPEC, CDRL (Request for Proposal, Statement of Work/Statement of Objectives, Specification, Contract Data Requirements List): The documents used in soliciting contracts for each phase of work. The RFP sets forth the needs, the SOW/SOO is the formal statement of these needs as requirements for contractual effort (what the contractor will do), the specification sets forth the technical requirements (what the system will do), and the CDRL definitizes the data deliverables.

VI. FUNDS MANAGEMENT

DSMC POC: Funds Management Department; (FD-FM); (703) 805-3755

Government Budget Plan: The generic title for an internal government document that plans the long-range budgeting strategy for the life of a given program.

Planning, Programming and Budgeting System (PPBS): The PPBS is a time-driven resource allocation process within DoD to request funding for all operations, including weapon system development and acquisition. It is essential to convert each program's event-driven acquisition strategy and phasing into the PPBS's calendar-driven funding profiles to assure the appropriate amount and type of funds are available to execute the desired program.

Planning phase - The Defense Planning Guidance (DPG) sets forth broad policy objectives and military strategy. The DPG guides the development of the Program Objectives Memorandum (POM).

Programming phase - The POM and the Program Decision Memorandum (PDM) are the keystone documents completed in this phase. The POM provides the services' strategies to meet the DoD objectives outlined in the DPG. The POM is reviewed by staff officers of the Secretary of Defense, the Commanders in Chief of unified and specified commands, and the Joint Chiefs of Staff. The reviews highlight major program issues and alternatives. The Deputy Secretary of Defense reviews the POM and the issues and decides on the appropriate course of action. The decisions are documented in the PDM.

Budgeting phase - The completion of the Budget Estimate Submission (BES). The BES is the POM documentation updated for the decisions outlined in the PDM. The BES is reviewed by the OSD Comptroller and the Office of Management and Budget (OMB) for execution feasibility. Funding changes due to execution issues are identified in Program Budget Decisions (PBDs). The updated BES is forwarded to OMB and incorporated into the President's Budget. The President's Budget is due to Congress no later than the first Monday in February.

Enactment - The process that Congress uses to develop and pass the Authorization and Appropriation Bills. In the enactment process, the DoD has an opportunity to work with Congress and defend the President's budget.

Types of Funds:

6.1 Basic Research includes all scientific study and experimentation efforts directed toward increasing knowledge and understanding in those fields of the physical, engineering, environmental, and life sciences related to long-term national security needs.
6.2 Applied Research includes all military applicability studies and experimentation efforts directed toward nonspecific weapon systems.
6.3a Advanced Technology Development includes all efforts directed toward projects that have moved into the development of hardware for test. The prime result for these efforts is proof of design concept.
6.3b Demonstration and Validation includes all efforts of projects in the PDRR acquisition phase.
6.4 Engineering Manufacturing Development (EMD): Includes all development efforts in the EMD acquisition phase.
6.5 Management and Support includes support of organizations, people, and facilities required for general research and development activities not funded under the Working Capital Funds concept. Test ranges, maintenance and support of laboratories, operations and maintenance of test aircraft and ships, and study and analyses in support of Research and Development programs funded by operations and maintenance are included.

Cost Estimating: A realistic appraisal of the level of cost most likely to be realized. The main estimation methods are analogy, parametric, engineering, and extrapolation from actuals.

Life-Cycle Cost (LCC): The total cost to the government of acquisition and ownership of the system over its full life. It includes the cost of development, acquisition, support, and (where applicable) disposal. The USD(A&T) has defined Defense Systems Total Ownership Cost (TOC) as Life-Cycle Cost.

DEFENSE SYSTEMS ACQUISITION MANAGEMENT PROCESS

BEST AVAILABLE COPY

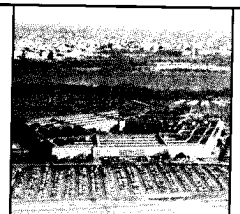
Nominal Time (In Years) | (0-2) | (2-4) | (4-7) | (12-79)

	PRE MILESTONE 0	PHASE 0 CONCEPT EXPLORATION (CE)	PHASE I PROGRAM DEFINITION & RISK REDUCTION (PDRR)	PHASE II ENGINEERING & MANUFACTURING DEVELOPMENT (EMD)	PHASE III PRODUCTION, FIELDING/DEPLOYMENT, & OPERATIONAL SUPPORT
TITLE					
PURPOSE	• Mission Area Assessment • Identify mission needs that cannot be satisfied by nonmaterial solutions • Prepare Mission Need Statement	• Evaluate Feasibility of Alternative Concepts • Determine Most Promising Concept(s)/Solution(s)	• Design System(s) • Demonstrate Critical Processes and Technologies (Early Prototypes)	• Mature and Finalize Selected Design • Validate Manufacturing & Production Processes • Test & Evaluate System	• Produce & Field/Deploy System • Monitor Mission Performance • Support Fielded System • Modify/Upgrade System as Required
DECISION POINTS	**MS 0** Approval to Conduct Concept Studies Approval of: • Conduct of Short-term Concept Studies • Phase 0 Exit Criteria	**MS I** Approval to Begin a New Acquisition Program Approval of: • Acquisition Strategy • Cost As an Independent Variable (CAIV) Objectives • Initial Acq Prog Baseline (APB) • Phase I Exit Criteria	**MS II** Approval to Enter Engineering & Manufacturing Development Approval of: • Acquisition Strategy • CAIV Objectives & Updated APB • LRIP Quantities • Phase II Exit Criteria	**MS III** Production or Fielding/Deployment Approval Approval of: • Acquisition Strategy/Updated APB • Production (weapon sys) or deployment (info sys) • Phase III Exit Criteria • Provisions for Post-deployment Performance evaluation	

Milestones and Phases determined by MDA

COMPLY WITH:
- Environmental Requirements
- Controlled Materiel Requirements

Disposal, Demilitarization, Detoxification, Waste Storage, and/or Recycling (as applicable)

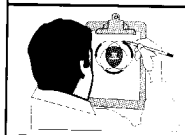


ACQUISITION POLICY

PROGRAM MANAGEMENT AND LEADERSHIP

- Requirements Analysis
- Acquisition Strategy Development & Maturation
- Functional Plan Development & Maturation
- Problem Solving/Decision Support Techniques (e.g., Risk Assessment, Decision Analysis)
- Study Team/Task Force/ Provisional PMO
- PMO Established (Charter, Mission/ Organization Support, IPPD & IPT Structure)
- PMO Staffing/Personnel Management
- Business Process Re-engineering Strategies
- Document Preparation & Refinement
- Risk Management & Program Review Activities (e.g., JROC, OIPT, DAB Reviews; SAR & DAES Reports; IBR,EVMS)
- Program Control Tools (e.g., CFSR Charts; Configuration Management; IDE; APB)
- Mission, Vision, Core Values Development
- Strategy Setting, Consensus/Team Building, Systems Integration, Change Management
- Team Success Factors
- MBTI
- Empowerment
- Team Dynamics
- Conflict Management & Strategies
- Expansion/Downsizing Strategies
- 360° Feedback
- Interpersonal Communications

Planning ***Organizing & Staffing*** ***Controlling*** ***Leading***



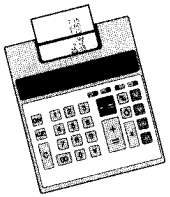
EARNED VALUE MANAGEMENT

EARNED VALUE MANAGEMENT FOR EACH CONTRACT

CONTRACT MANAGEMENT

Contract Type Selection

Contract Type	Cost Type or Firm Fixed Price (Level of Effort)	Cost Plus Fixed Fee Cost Plus Incentive Firm Cost Plus Award Fee	Cost Plus Incentive Fee Fixed Price Incentive Firm Cost Plus Award Fee	Fixed Price Incentive Firm Firm Fixed Price	Fixed Price Incentive Firm Firm Fixed Price
Nature of Effort	Research (Very Broad Requirement)	Development		Production (Well-defined Requirements)	Follow-On Production Upgrade/Maintenance



FUNDS MANAGEMENT

Planning, Programming and Budgeting System

POM Yr A	Planning	Programming	Budgeting	Enactment	Execution	
POM Yr B		Planning	Programming	Budgeting	Enactment	Execution
POM Yr C			Planning	Programming	Budgeting	Enactment
POM Yr D				Planning	Programming	Budgeting

Note: PPBS & Enactment are Calendar-Driven Processes
Planning and Programming include estimates for outyears

POM Yr W	Planning	Programming	Budgeting	Enactment	Execution	
POM Yr X		Planning	Programming	Budgeting	Enactment	Execution
POM Yr Y			Planning	Programming	Budgeting	Enactment
POM Yr Z				Planning	Programming	Budgeting

Types of Funds

RDT&E - 6.1 Basic Research	RDT&E - 6.2 Applied Research	RDT&E - 6.3a Advanced Technology Development	RDT&E - 6.3b Demonstration and Validation	RDT&E - 6.4 Engineering Manufacturing Development

RDT&E - 6.5 Management and Support

Procurement

Operations and Maintenance

Cost Estimation Methods (as % of time spent)

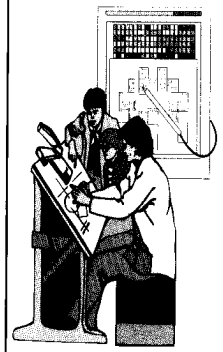
- Parametric
- Analogy
- Extrapolation from Actuals
- Engineering
- Gross Estimating
- Detailed Estimating

ESTIMATE ESTIMATE

S (SUGGESTED BY DoD 5000.52) EXPECTED TO BE REPRESENTED ON VARIOUS IPTs

FUNCTIONAL GOVERNMENT ACQUISITION DISCIPLINES

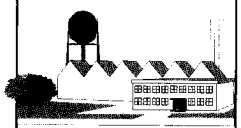
SYSTEMS ENGINEERING



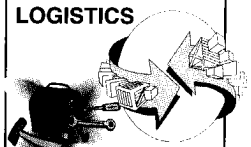
SOFTWARE ACQUISITION MANAGEMENT

TEST AND EVALUATION

MANUFACTURING & PRODUCTION



ACQUISITION LOGISTICS



Requirements Generation System

The Common Thread Linking ALL Disciplines

System (Product) Definition

Mission Need Statement

Program Definition

Management Baselines

Allocated Baseline

Product Baseline

Concept

System

Subsystems

Design Documentation Necessary for Production Complete

Deficiency Correction

Modifications Product Improvements

Technical Management Plan (TMP)

Update

Preplanned Product Improvement (P³I)

Design Reviews and Audits

ASR SRR SFR SSR PDR CDR TRR FCA SVR PCA

Note: Names and Timing of Design Reviews and Audits may be Tailored to the Needs of the Program.

ENGINEERING CHANGE REVIEWS

Alternative Concepts

One or More Concepts, Design Approaches, and/or Parallel Technologies

Stable, Interoperable, Producible, Supportable, Cost-effective Design

Deployed System

Modernized System

Operational Capability That Satisfies Mission Needs

Production Design

Modifications

Operational Requirement Document (ORD)

System Threat Assessment

System Performance Specification

Item Performance Specifications

Item Detail Specifications

Gain Thorough Familiarity with Threat and Operational Requirements

Reassess Threat

OSD PSA/JROC Validates Mission Need and Process Integrity IAW DoDD 8000.1 for ACAT IA (Usually MAIS) Programs

Information Assurance Requirements

Operations Risk Assessment

C4I Interoperability Requirements

SSS

SW Achitecture: Establish Basis

SW Achitecture: Select & Acquire

SW Achitecture: Refine

Risk-Driven Software Metrics Selection

JTA

SIP

SW Req'ts Refinement

Most Promising SW Design

Software Development (Tailored Life Cycle)

SDP

STrP

SPS

Standard Data

Developer Maturity

Programming Language Selection

SIs

Maintaining, Adapting, Perfecting the Fielded Software System

Software Support and Maintenance

Re-evaluates Programming Language Choice

Implement SW Support Concept

Y2K Compliance

ORD Software Requirements

C4I Support Plan

OCD

Computer Resource Support Plan

Computer Resource Support Plan Updates

Software Support

Preparation

Preliminary TEMP Approval

TEMP Update

TEMP Approval

TEMP Update

TEMP Approval

TEMP Update

Developmental Test & Evaluation (DT&E)

Component

Prototype

Advanced Prototype

Qualification Testing

Production Qualification T&E

Production Acceptance T&E

Modification T&E

DT/OT Test Reports

DT/OT Test Reports (BLRIP, LFTE)

Operational Test & Evaluation (OT&E)

Early Operational Assessment

Operational Assessment

Initial Operational T&E

Follow-On T&E

Combined Developmental/Operational T&E

Modeling & Simulation

Subsystem Integration T&E

System Hardware & Software T&E

Survivability T&E

Live Fire T&E Waiver (if applicable)

Vulnerability and Lethality T&E

Full-Up Live Fire T&E

Recognize/Act Upon Environmental Concerns

Identify Key Process Characteristics

Participate in IPPD activities

Variability Reduction Activities

Influence the Process (Through Producibility Engineering & Planning)

Spare Parts Production

Value Engineering

Evaluate Production Feasibility

• Material/Process Capabilities

• Tooling Concept

Phased Producibility Assessments

Material/Process Trade-offs

Tooling Design

Second Source/Breakout Decisions

Assess Production/Process Advances for Redesign & Production

ICA

Evaluate Mantech Needs

Estimate Manufacturing Costs

Establish Design-to-Goals

Production Strategy

Assess Production Risk

Complete Mantech Development

Quality Assurance Planning

Preliminary Manufacturing Plan

Resolve Production Risk

Final Manufacturing Plan

Process Proofing/Process Repeatability

Execute Manufacturing Plan

Build-to-print

• Start Detailed Production Planning

• Start Long Lead Procurement

• Start Material Procurement

LRIP

• Experience with Existing System

• Identify Significant Support Constraints

ALTERNATIVE CONCEPTS

ALTERNATE DESIGNS

THE DESIGN

Logistics Strategy

Systems Engineering/ Supportability Analysis Process

• Logistics Inputs to ORD

• Investigate Alternative Support Methodologies

• PPBS/LCC/CAIV Interface

• Influence Product Definition

• TEMP Input

SP

• Identify/Define/Assess Logistic Implications of Each Alternate Design

• Influence Selection of Preferred Design Alternative

• PPBS/LCC/CAIV Interface

• Select & Refine Support Concept

• TEMP Input

Revised SP

• Complete Plan for Support of Fielded System

• Begin Deployment Planning

• Plan for Post-production Support

• Influence Detailed Design

• PPBS/LCC/CAIV Interface

• Design Items of Support

• Test & Evaluate the Logistics

DRAFT

REVISED

PPS Plan

Deployment Plan

• PPBS/LCC/CAIV Interface

RATE PRODUCTION OF DESIGN & SUPPORT SYSTEM

Deployment

Closed

Modernization Through Spares

Implement Deployment Plan

Concurrent Delivery of the Production System and all Requisite Support Items

MODIFICATIONS

Readiness & Sustainability

ENGINEERING CHANGES

IMPLEMENT POST-PRODUCTION SUPPORT PLAN

PRODUCT IMPROVEMENTS

Readiness & Sustainability

TECHNOLOGY UPGRADES & INSERTION

Please address all improvement suggestions on this chart to:
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Fort Belvoir, Virginia 22060-5565
Email: MCILVAINEP@dsmc.dsm.mil
Phone: (703) 805-4660

To order adtional hard copies of this chart, see reverse side.
For additional information, visit the DSMC Internet Website:
http://www.dsmc.dsm.mil

NOTES ON TAILORING:

1. The number of milestone reviews and program phases shall be determined by the Milestone Decision Authority [MDA] for each individual program at program initiation.
2. The documents applicable to a particular program at a specific milestone shall be determined individually for each program through the IPT process and the MDA approval process.

DSMC CHART# 3000R3
1999
DSMC CHART 3000 R3

VII. SYSTEMS ENGINEERING (SE)

DSMC POC: Systems Engineering Department; (FD-SE); (703) 805-5258

The function that controls the total system development effort for the purpose of achieving an optimum balance of all system elements is SE. The SE process is designed to translate operational needs and/or requirements into a system solution that includes the design, manufacturing, T&E, and support processes and products. SE establishes a proper balance among performance, risk, cost and schedule, employing a top-down iterative process of requirements analysis, functional analysis and allocation, design synthesis and verification, and system analysis and control.

A. Configuration Management (CM) Baselines -

1.) **Functional Baseline** - The technical portion of the program requirements (system performance specification) that provides the basis for contracting and controlling the system design.
2.) **Allocated Baseline** - Defines the performance requirements for each configuration item of the system (item performance specifications). It is normally established at PDR (preferably by the contractor).
3.) **Product Baseline** - Established by the detailed design documentation for each configuration item (item detail specifications) and includes the process baseline and materiel baseline.

B. Preplanned Product Improvement (P3I) - A deliberate decision delaying incorporation of a system capability but providing growth allocations for the capability.

C. Technical Management Plan (TMP) - The TMP defines the contractor's plan for the conduct and management of the fully integrated effort necessary to satisfy the general and detailed requirements as implemented by the Request for Proposal (RFP) or contract schedule, statement of work/objectives, and specifications. (Best Practices)

D. Design Reviews and Audits

1.) **ASR - Alternative Systems Review** - A formal review conducted to demonstrate the preferred system concept(s).
2.) **SRR - System Requirements Review** - A formal, system-level review conducted to ensure that system requirements have been completely and properly identified and that there is a mutual understanding between the government and contractor.
3.) **SFR - System Functional Review** - A formal review of the conceptual design of the system to establish its capability to satisfy requirements. It establishes the functional baseline.
4.) **SSR - Software Specification Review** - A formal review of requirements and interface specifications for computer software configuration items.
5.) **PDR - Preliminary Design Review** - A formal review which confirms that the preliminary design logically follows the SFR findings and meets the requirements. It normally results in approval to begin detail design.
6.) **CDR - Critical Design Review** - A formal review conducted to evaluate the completeness of the design and its interfaces.
7.) **TRR - Test Readiness Review** - A formal review of the contractors' readiness to begin testing computer software configuration items.
8.) **FCA - Functional Configuration Audit** - A formal review conducted to verify that all subsystems can perform all of their required design functions in accordance with their functional and allocated configuration baselines.
9.) **SVR - System Verification Review** - A formal review conducted to verify that the actual item (which represents the production configuration) complies with the performance specification.
10.) **PCA - Physical Configuration Audit** - A formal review that establishes the product baseline as reflected in an early production configuration item.

E. System/Product Definition - This is the natural result of the threat/opportunity-driven Requirements Generation System and the common thread (or area of common interest) among all acquisition disciplines.

1.) **Mission Need Statement (MNS)** - A formal document, expressed in broad operational terms and prepared in accordance with CJCS 13170.01, that documents deficiencies in current capabilities and opportunities to provide new capabilities.
2.) **Program Definition** - The process of translating broadly stated mission needs into a set of operational requirements from which specific performance specifications are derived.
3.) **Operational Requirements Document (ORD)** - A formatted statement, which is prepared by the user or user's representative, containing operational performance parameters for the proposed concept/system that defines the system capabilities needed to satisfy the mission need. It is prepared at each milestone, usually beginning with Milestone I.
4.) **System Threat Assessment & Projections** - Prepared by a collaboration among the intelligence, requirements generation, and acquisition management communities to support program initiation (usually Milestone I). It is maintained in a current and approved or validated status throughout the acquisition process.

VIII. SOFTWARE ACQUISITION MANAGEMENT

DSMC POC: Software Management Department; (FD-SM); (703) 805-3788

Major, modern DoD systems are almost always software-intensive, in which software is the largest segment in any system development cost, system development risk, system functionality, or development time criteria. DoDD 5000.1 and DoD 5000.2-R combine and integrate policy requirements and management guidance for weapons systems software, C3I systems, and Automated Information Systems (AISs).

An AIS is a combination of computer hardware and software, data, or telecommunications that performs functions such as collecting, processing, transmitting, and displaying information.

Pre-Phase 0: Determining Mission Needs: DoD 5000.2-R requires confirmation that requirements defined in DoDD 8000.1 (*Defense Information Management Program*) have been met for ACAT IA programs.

Phase 0: CE: Broad system concepts are defined. Depending on the type of software-intensive system being developed, other key Phase 0 activities typically could include:

- Assessing Information Operations risks IAW DoDD 3600.1.
- Assessing information assurance requirements.
- Addressing compatibility, interoperability, and integration goals for Command, Control, Communications, Computer, and Intelligence (C4I) Systems IAW DoDD 4630.5, DoDI 4630.8 & CJCSI 6212.01A. Note that all systems that interface with C4I systems also require a C4I Support Plan
- Planning for software maintenance [Post Deployment Software Support, (PDSS)]. This planning is normally accomplished by a Computer Resources IPT (CR-IPT), which may prepare a Computer Resources Life Cycle Management Plan (CRLCMP) or its equivalent.
- Refinement of ORD requirements related to software (support and integration requirements).

Phase I: PDRR: Initial software requirements are refined. Other key Phase I activities typically could include:

- Development and refinement of an Operational Concept Document (OCD), a System/Subsystem Specification (SSS), and Software Requirements Specifications (SRS).
- Establishment of the basis for the system's *Software Architecture*.
- Selection and tailoring of an appropriate software development standard and acquisition strategy.
- Initial identification of Software Items (SIs).

Phase II: EMD: EMD translates the most promising design into a mature, producible design. Depending on the type of software-intensive system being developed, key Phase II activities typically could include:

- Refinement of the system's *Software Architecture*. Mandatory guidance is included in the Joint Technical Architecture (JTA).
- Generation of a Software Development Plan (SDP) by a developer.
- Use of mandatory DoD standard data elements (DoDD 8320.1).
- A widely-used "Best Practice" in assessing the maturity of a developer's process is the Software Capability Evaluation (SCE), an on-site assessment of software process maturity.
- Decision on use of an appropriate programming language.
- Risk-based software metrics, based on service policies and OSD's Practical Software Measurement (PSM) initiative and refined from previous life cycle phases, are used to gain visibility into EMD software development activities.
- Key developer-produced outputs of the Software Development Process can include a Software Transition Plan (STrP), used to transition the software to a support environment and a Software Installation Plan (SIP), used to assist in Phase III fielding activities.
- A Software Product Specification (SPS), produced by the developer, is normally used to establish the software product baseline.

Phase III: Production, Fielding/Deployment & Operational Support: Post Deployment Software Support (PDSS) activities, by far the largest cost component of the software life cycle, are initiated for the operational support requirement of this phase IAW with the chosen software support concept.

IX. TEST AND EVALUATION (T&E)

DSMC POC: Test and Evaluation Department; (FD-TE); (703) 805-5290

T&E is a process by which a system or components are compared against requirements and specifications through testing. The results are evaluated to assess progress of design, performance, supportability, and the like.

Beyond Low Rate Initial Production (BLRIP) Report: Completed by the Director, Operational Test and Evaluation (DOT&E) to assess the Initial Operational Test and Evaluation (IOT&E) for a developing system for the Milestone III decision. A copy is provided to Congress.

Combined Developmental and Operational Testing (DT/OT): Combining DT and OT is encouraged to achieve time and cost savings. The combined approach shall not compromise either DT or OT objectives. A final independent phase of IOT&E shall still be required for ACAT I and II programs for BLRIP decisions.

Developmental Test and Evaluation (DT&E): A technical test conducted to provide data on the achievability of critical system performance parameters. This testing is performed on components, subsystems, and system-level configurations of hardware and software.

DT&E Report: The developing agency shall prepare a DT&E Report and formally certify that the system is ready for the next dedicated phase of OT&E.

Follow-On OT&E (FOT&E): OT&E needed during and after the production phase to refine estimates from the IOT&E, to evaluate system changes, and to reevaluate the system as it continues to mature in the field. FOT&E may evaluate system performance against new threats or in new environments.

Full-Up Live Fire T&E (LFT&E): A system-level live fire test of an ACAT I or II covered system, major munitions, or missile program, or a product improvement to one of these systems configured for use in combat. Required before going BLRIP.

Initial Operational T&E (IOT&E): All OT&E conducted on production or production representative articles to support the decision to proceed BLRIP. It is conducted to provide a valid estimate of expected system operational effectiveness and suitability for ACAT I and II systems.

Lethality T&E: Testing the ability of a munitions to cause damage that will cause the loss or a degradation in the ability of a target system to complete its designated missions.

LFTE Report: Completed by the DOT&E for ACAT I and II systems that have been subjected to a full-up live fire test prior to MS III. Usually included in the DOT&E report of the IOT&E (BLRIP report) when sent to Congress.

Modification T&E: Testing done after Milestone III to evaluate modifications/upgrades/improvements to the system.

TEST AND EVALUATION (T&E) *CONTINUED*

Operational Assessment: An evaluation of operational effectiveness and suitability made by an independent operational test agency, with user support as required, on other than production systems.

Opertational T&E (OT&E): The field test, under realistic combat conditions, of any item (or key component of), weapons, equipment, or munitions for the purpose of determining the effectiveness and suitability for use in combat by typical military users, and the evaluation of the results of such test. Required for ACAT I and II programs.

Production Acceptance T&E (PAT&E): T&E of production items to demonstrate that items procured fulfill requirements and specifications of the procuring contract or agreements.

Production Qualification T&E: A technical test conducted to ensure the effectiveness of the manufacturing process, equipment, and procedures. These tests are conducted on a number of samples taken at random from the first production lot and are repeated if the design or process is changed significantly.

Qualification Testing: Testing that verifies the contractor's design and manufacturing process and provides a performance parameter baseline for subsequent tests. (Best Practice)

Survivability T&E: Testing the capability of a system and crew to avoid or withstand a manmade hostile environment without suffering an abortive impairment of its ability to accomplish its designated mission.

Test and Evaluation Master Plan (TEMP): The testing strategy in the TEMP for ACAT I and IA programs shall focus on the overall structure, major elements, and objectives of the test and evaluation program that is consistent with the acquisition strategy.

Vulnerability T&E: Testing a system or component to determine if it suffers definite degradation as a result of having been subjected to a certain level of effects in an unnatural hostile environment. A subset of survivability.

X. MANUFACTURING AND PRODUCTION

DSMC POC: Manufacturing Management Department; (FD-MM); (703) 805-3763

Manufacturing (also referred to as Production) is the conversion of raw materials into products and/or components through a series of manufacturing procedures and processes. Manufacturing Management is the technique of planning, organizing, directing, controlling, and integrating the use of people, money, materials, equipment, and facilities to accomplish the manufacturing task economically.

Assess and Resolve Production Risk: Identify and demonstrate required advances beyond the current capability.

Assess Production Risks: Estimate probabilities of success or failure in manufacturing.

Complete Manufacturing Technology Development: Manufacturing technology is developed through a phased approach from definition to demonstration. This represents the final demonstration of the integrated manufacturing scheme.

Establish Design to Goals: Establish design parameters for the system.

Estimate Manufacturing Costs: Develop resource estimates for manufacturing of various system alternatives.

Evaluate Manufacturing Technology (MANTECH) Needs: Discriminate manufacturing capabilities versus requirements to define new facilities and equipment needs.

Evaluate Production Feasibility: Assess the likelihood that a system design concept can be produced using existing manufacturing technology.

Final Manufacturing Plan: The refined and formalized initial manufacturing plan. This plan is not required in support of milestone decisions and shall not be used as milestone documentation or as periodic reports.

Industrial Capability Assessment (ICA): A legal requirement (10 USC 2440) at each milestone to analyze the industrial capability to design, develop, produce, support, and (if appropriate) restart the program.

Influence the Design Process (Through Producibility Engineering and Planning): Application of design and analysis techniques to reduce the potential manufacturing burden.

LRIP: Low rate of output used to prove manufacturing technology and facilities at the beginning of production.

Preliminary Manufacturing Plan: The description of a method for employing the facilities, tooling, and personnel resources to produce the design. The Manufacturing Plan belongs to the PM and is used to manage program execution throughout the life cycle of the program. This plan is not required in support of milestone decisions and shall not be used as milestone documentation or as periodic reports.

Producibility Assessments: Assessments of the producibility aspects of proposed design alternatives/approaches.

Phased Producibility Assessments: Discretionary assessments of a program to determine if the design of the product and the manufacturing process are ready for the production phase. These should be conducted in conjunction with other design reviews.

Production Strategy: The approach to obtaining the total quantity of a system at some rate for some cost.

Second Source/Breakout Decisions: Execution of acquisition strategy to establish two producers for the part or system and/or strategy to convert some parts or systems from contractor furnished to government furnished.

Spare Parts Production: Arrange for purchase of spare parts or a portion of normal production runs.

Value engineering (VE): A program to allow for the sharing of cost savings derived from improvements in the manufacturing processes.

XI. ACQUISITION LOGISTICS

DSMC POC: Logistics Management Department; (FD-LM): (703) 805-2497

Acquisition Logistics is a multifunctional technical and management discipline associated with the design, development, test, production, fielding, sustainment, and improvement/modification of cost-effective systems that achieve the user's peacetime and wartime readiness and sustainability requirements. The principal goals/objectives of acquisition logistics are:

- To influence system design
- To concurrently field the system and its necessary support infrastructure, and
- To improve the system and its support.

Support Elements, such as the following, have traditionally been included under Acquisition Logistics:

1.) Maintenance Planning
2.) Manpower and Personnel
3.) Supply Support
4.) Support Equipment
5.) Technical Data
6.) Training and Training Support
7.) Computer Resources Support
8.) Facilities
9.) Packaging, Handling, Storage and Transportation
10.) System/Design Interface

Support Plan (SP) (also known as Integrated Logistics Support Plan (ILSP) or Acquisition Logistics Support Plan (ALSP)) - Best Practice in logistics generally involves preparing and maintaining a formal or informal document for support of the fielded system. The SP belongs to the PM and is used to manage program execution throughout the life cycle of the program. This plan is not required in support of milestone decisions and shall not be used as milestone documentation or as periodic reports. It may be prepared as a stand-alone document or as an annex to other documents such as the TMP.

Deployment Plan - The plan to provide for a smooth introduction of the system/equipment to the user. This plan is not required in support of milestone decisions and shall not be used as milestone documentation or as periodic reports. This plan may be prepared as a "stand-alone" document or an annex to the Support Plan.

Post Production Support Plan (PPSP) - A plan to ensure continued systems management and support activities to ensure continued attainment of system readiness objectives with economical logistic support after cessation of production of the end-item (system or equipment). This plan is not required in support of milestone decisions and shall not be used as milestone documentation or as periodic reports. This plan may be prepared as a "stand-alone" document or an annex to the Support Plan.

Supportability Analysis - An analytical tool, conducted as part of the SE process, to determine how to most cost effectively support the system over its entire life cycle and form the basis for related design requirements included in the specifications. See MIL-HDBK-502 and MIL-PRF-49506.

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1999

AIR FORCE NEWS SERVICE

JDAM Course Ushers B-1 Students Into New Era

STAFF SGT. ED SCOTT, U.S. AIR FORCE

NELLIS AIR FORCE BASE, Nev. (AFPN, Oct. 21, 1999) – The U.S. Air Force Weapons School B-1 Division at Ellsworth Air Force Base, S.D., now exposes upcoming aircrew instructors to the latest weapons available – joint direct-attack munitions.

"This is the first time the B-1 Weapons School has been able to expose students to a new weapon prior to its operational debut with all B-1 units," said Lt. Col. Dan Walker, B-1 Division commander. "We were able to introduce the weapon system into the syllabus without adding more days."

The colonel said the school increased syllabus sorties to accommodate the weapon through a tighter flying schedule. JDAM training was added to the current syllabus six months ago. The development of the missions and training of the aircrew began in July.

The B-1, a long-range strategic bomber, has always been capable of flying intercontinental missions, penetrating enemy defenses, then performing a variety of missions using Mark-82 conventional 500-pound bombs as well as CBU-87/89/97s without refueling.

"Adding JDAMs to the B-1's arsenal makes it more effective," said Walker. "An aircrew can directly pinpoint and destroy a hardened target directly, ensuring accuracy, making the B-1 a much more valuable asset."

The aircraft is capable of holding 24 of these Global Positioning System-guided weapons – more than any other aircraft in the world, "which means the B-1 is capable of holding more targets at risk," Walker said.

"Being able to carry 84 500-pounders makes the B-1 a formidable asset. With JDAM we can strike more hardened targets with accuracy," he said.

Walker said this addition to the bomber's arsenal is significant.

"Mostly gone are the days of carpet bombing. There really aren't too many targets strung out over a quarter-mile area. Today's battles require weapons to be right on target," he said.

Walker said JDAMs are similar to laser-guided munitions, except that laser-guided munitions are hindered by rain and fog.

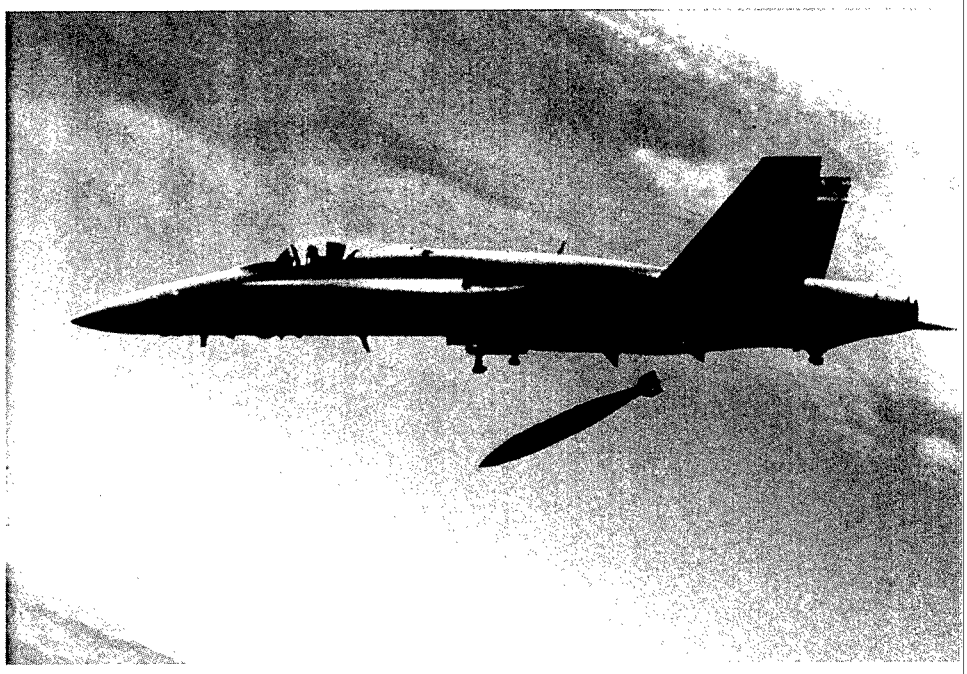
"Being GPS-guided eliminates this problem with JDAM," Walker said.

"With the new strike packages being created by [aerospace expeditionary force], the B-1 is especially suited for the composite forces," he said. "With the aircraft's speed and altitude, JDAM effectively puts a lot of firepower into a strike package."

Another advantage Walker pointed out is the fact that commanders can know if the mission was a success "minutes after target attack."

When this class graduates in June, Ellsworth and Dyess AFB, Texas, will have experienced JDAM aircrews.

"As we graduate other classes, we will gain experience at all B-1 bases," Walker said.



DEVELOPED BY BOEING, THE JOINT DIRECT ATTACK MUNITION (JDAM) IS A GUIDANCE KIT THAT CONVERTS EXISTING UNGUIDED FREE-FALL BOMBS INTO PRECISION-GUIDED MUNITIONS.

Photo courtesy The Boeing Company

Editor's Note: *Scott is on the staff of the Air Warfare Center Public Affairs Office, Nellis AFB, Nev. This information is in the public domain at* ***http://www.af.mil/news.***

Army Embedded Global Positioning System Receiver (AEGR)

Congressional Mandate Impetus for New, Innovative Army Program

COL. JAMES C. BARBARA, U.S. ARMY (RET.)

Public Law 66 legislates, as documented in the Congressional Record, H9194, Nov. 10, 1993:

"Limitation on procurement of systems not GPS-equipped: After September 30, 2000, funds may not be obligated to modify or procure any Department of Defense aircraft, ship, armored vehicle, or indirect-fire weapon system that is not equipped with a Global Positioning System receiver."

As a result of Public Law 66, Army officials managing the Abrams Tank M1A2 Systems Enhancement Program (SEP) determined in December 1995 that in order to comply with the directive, while simultaneously meeting the already demanding requirements of the Abrams SEP, they must embed Global Positioning System (GPS) functionality. By integrating GPS performance characteristics along with the existing, on-board Position/Navigation (Pos/Nav) inertial navigation unit, the Army stood to gain a major combat power enhancement. Further facilitating GPS integration was the fact that the current navigation unit was already dynamically interactive with other on-board subsystems.

Critical challenges to the Army Embedded GPS Receiver (AEGR) program were fourfold:

- The SEP program was already off and running, but less than one year remained on the program schedule for contract solicitation and award; design and development; and generation of prototype hardware without adversely impacting the tank program's schedule.
- A budget-constrained process, the SEP's critical focus was digitization.
- The Vetronics architecture[1] of the tank was already designed and allocated; due to existing constraints and Preplanned Product Improvement (P3I) requirements, only one slot, in the Mission Processor Unit (MPU), was reasonably available.
- GPS was "new" scope, and a contracting vehicle had to be found quickly.

HTI-Based Approach

Army Lt. Col. George Patten, Product Manager, M1A2 Abrams, realized immediately that effectively integrating GPS into the existing navigation unit, while simultaneously exercising sound risk management in several areas, called for a creative solution. Patten and Army Col. Christopher Cardine, Abrams Project Manager, were convinced only an innovative, Horizontal Technology Integration or HTI-based approach would meet the challenges posed by the AEGR program, yet still allow the program to remain within cost, on schedule, and within acceptable performance risk parameters. Together, they determined HTI was the key to satisfying administrative and contractual prerequisites, as well as the Quality Assurance and Logistical demands of SEP's testing and fielding plans.

Patten had to make fast, yet well-informed decisions. Seeking advice from other Weapon System program offices, he contacted Army Lt. Col. Bob Buckstad, Product Manager Avionics, U.S. Army PEO Aviation, who already had experience embedding GPS in the Army's aviation fleet as part of his work with joint programs. Their mutually beneficial exchange of information included GPS contracting options, technical insights, HTI opportunities, and cost information.

Although HTI has several beneficial characteristics – reduction of duplicative nonrecurring engineering efforts, economy-of-scale savings in procurement, and life cycle sustainment benefits – still its implementation routinely runs into programmatic obstacles – chiefly *control.*

- Lead Weapon System Office – The lead weapon system office(s) must "share" control; HTI requires more in-depth, front-end analyses; the "perception" persists that some design compromises may be necessary.
- Trailing Weapon System Office – The trailing weapon system office(s) "feel" that they are giving up some control and funds; they may not get all the

Barbara *is the Executive Director, Systems Integration, Assurance Technology Corporation. A certified Level III Acquisition Corps officer, he is a former TRADOC Systems Manager (TSM) for Tanks; and Product/Project Manager for the M1A2 Abrams, the Block III Tank & Common Chassis, Armored Systems Modernization-Future, and Armored System Integration (ASI). Barbara also served as the Deputy Program Executive Officer for Armored System Modernization (ASM) and Tactical Wheeled Vehicles (TWV). He is a graduate of the U.S. Army War College, the Defense Institute of Security Assistance Management, and the Defense Systems Management College.*

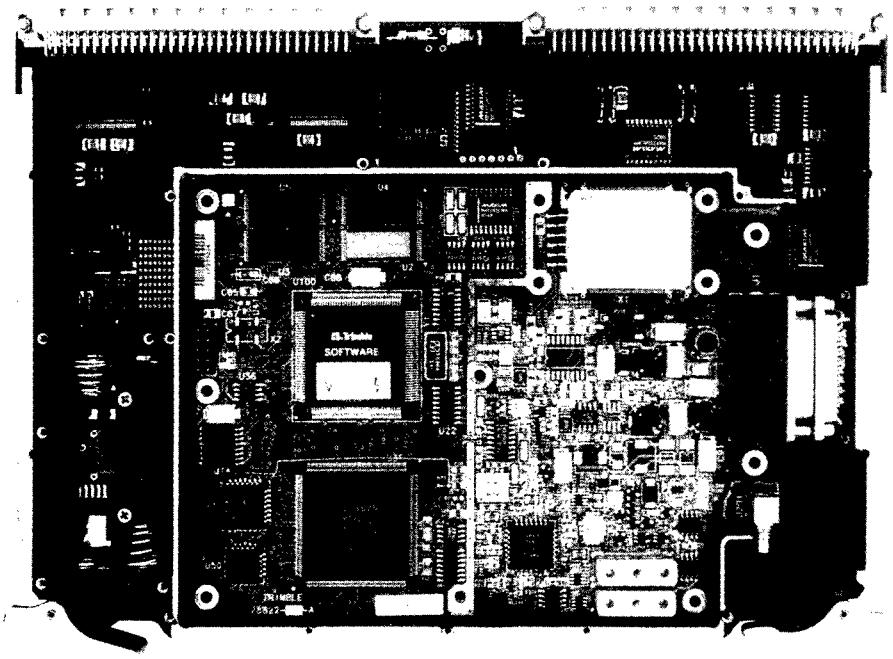
attention they expect; moreover, their program may incur "additional risk," depending upon delivery of the Government Furnished Equipment/Contractor Furnished Equipment item(s).

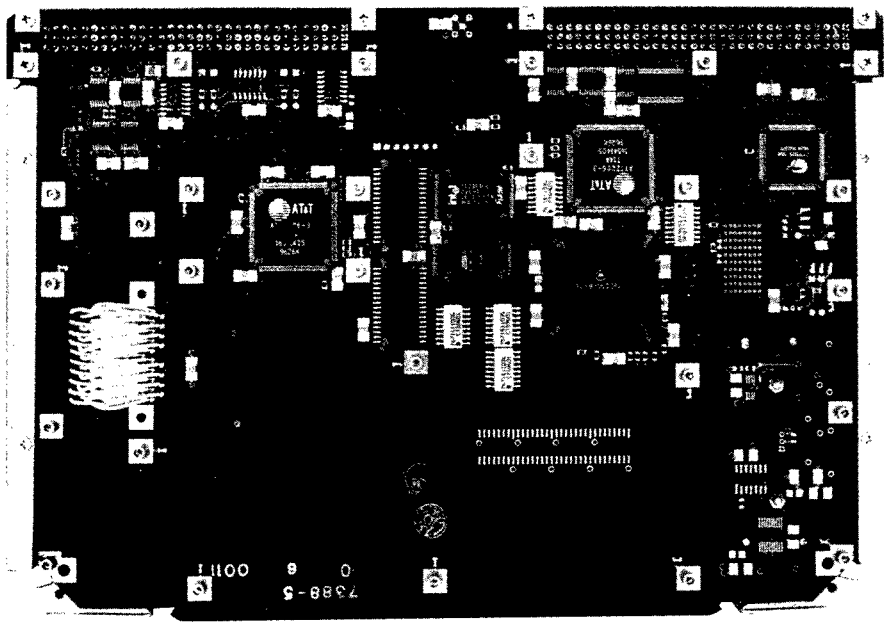
- Contractor – Further, prime contractors on all sides, often accused of using any disruption in the HTI program as the cause of any internal perturbations, may have wanted to keep the business in-house.

The AEGR program overcame these obstacles with a combination of strong leadership from the top, and continuous communication and cooperation among the players.

The Plan

During the 1995 Christmas holidays, an innovative program plan was born. It required the support and cooperation of numerous agencies to plow new ground and set new standards. All eyes focused on the successful achievement of the objective, rather than suffering the oppressive inertia of "business-as-usual."





AEGR Top & Bottom Views

Photos by Darell Libby, Assurance Technology Corporation

Integrated Product Team

Based on information gleaned from a variety of contacts and sources, Patten concluded that formation of an informal Integrated Process/Product Team (IPT) was the next step. Although the membership would not have all the "traditional" contractual relationships, Patten concluded they would still require mutual responsiveness and support. Toward that end, he devised a membership that included: the Abrams PM; the Abrams Prime contractor; General Dynamics Land Systems (GDLS); the GPS Joint Program Office (JPO); and the Army PM, GPS, as a source for GPS engines. Also needed were an HTI representative; a contracting agency with an existing contract; and a contractor with experience in Systems Engineering, the rapid prototyping of leading-edge technologies for weapon systems, and GPS technology.

Although the AEGR was designated a Government Furnished Equipment item, the IPT process created a mutually beneficial environment for all involved. Several outstanding professionals contributed to the success of the program:

- GDLS – Rich Dinges, Director of Tank Programs appointed special engineers with expertise on the MPU and the Vetronics Architecture. Tom Yestrepski, MPU Engineer, provided all necessary documentation as well as critical insights to the Systems Engineering Process. He also scheduled M1A2 SEP Systems Integration Laboratory time to support the AEGR effort.
- GPS JPO – Air Force Col. James Armor, System Program Director, Navigation Satellite Timing and Ranging (NAVSTAR) GPS Joint Program Office, provided critical support from his office. Air Force Col. Stephen Opel, Chief of User Equipment, dedicated essential security engineers to the project. Mike Dash and Bob Cook, JPO Principal Investigators from ARINC Corporation, attended all AEGR reviews; arranged for JPO-GPS authorization and scheduling of GPS security

modules for release; and identified variances in, and provided changes to, the GPS Datums. Together, they conducted a Baseline Design Review and an Intermediate Design Review to verify and validate design of GPS engine security within the AEGR, in accordance with CZE-93-105.[2] Cook and Dash also conducted a site survey of the production process and facility, thus expediting the approval process for the implemented security measures.

- Cardine assigned Natalie Dunbar the Team Leader, with support from all branches of the Abrams office. Chris White, PM Abrams, served as Lead Engineer for the MPU and acted as the main conduit among players, facilitating exchange of information and resources. Additionally, Dave Busse from the HTI division of PM ASI worked to optimize AEGR's application to other Ground Combat and Support Systems.
- Army PM GPS – Army Lt. Col. Joe Lofgren included the AEGR program in the Army GPS IPT and spearheaded, within the GPS community, the rising demands of the combined arms ground combat team, a relatively new (but clearly the largest) GPS customer base – most of whom use, as a standard form factor, the Versa Module Europa circuit card assembly.
- Naval Research Laboratory (NRL) assigned Neil Russell as the AEGR Principal Investigator and David DeRieux as the Lead Technical Engineer. Russell allocated the GPS design, development, and integration tasks to Assurance Technology Corporation, which has experience in embedding GPS and leveraging HTI initiatives.

IPT Actions

The key to success was not just in what the IPT did, but rather how they went about it. Yes, several innovative technological applications emerged, but more importantly, a pro-active, forward-thinking attitude characterized the team's day-to-day efforts. Close communication and cooperation thrived, as the IPT worked doggedly to avoid or eliminate obstacles. A success-oriented atmosphere permeated the program, and not even the slightest perception of bureaucratic inertia or "business-as-usual" survived!

Since delivery was a mere nine months away, the IPT went straight to work. GDLS carefully delineated the Abrams SEP systems-level specification, performance characteristics of the Pos/Nav system, and the requirements for the AEGR. In addition, GDLS delineated Interface Control Documents (ICD) for the MPU and the 1553 bus management[3] for the core architecture of the SEP. Assurance Technology Corporation, in close coordination with GDLS, published an A-Specification for the AEGR.

The company also conducted a market survey to identify the best possible GPS engine candidate based on cost, schedule, performance, and P3I features for the impending Navigation Warfare (NAVWAR) requirements. Eventually, Assurance Technology selected the Trimble Force 2 engine. Trimble provided a significant economy-of-scale discount to the AEGR program since a pre-existing open production order with HTI-quantity options was already in place and supplying engines to other embedded systems among the Services. Trimble, a significant contributor to the NAVWAR program, assured PM Abrams and Assurance Technology that the footprint of its new engine allowed for optimum P3I upgrade without altering the AEGR base module. All changes would be handled through software revisions at the open interfaces of the GPS receiver.

Since only one slot remained available in the MPU, Assurance Technology used its successful experiences in Space and Aerospace development and production to design a creative AEGR program. Using the available pins on the existing MPU backplane, their architecture integrates the engine as a mezzanine board and densely compacts a host of functions (to interoperate with other tank subfunctions), using advanced technology like a Ball Grid Array processor. Assurance Technology also leveraged its team of longstanding, highly responsive, "Best Value" vendors to provide key components out of sequence. Together, Assurance Technology and GDLS conducted final testing of the card to assure full functionality. Its final design facilitates the physical P3I process as a repair action by automated "Pick & Place" machines.

The Results

The AEGR card was successfully developed, fabricated, integrated, tested, and delivered in nine months. The architect of the AEGR, Lou Palecki, Director of Engineering, Assurance Technology, met and exceeded the "only-one-slot-available" challenge by first identifying key specifications the card had to meet: hosting a GPS engine; extracting and managing Position, Velocity, and Timing data; distributing data to the various weapon system subfunctions; providing numerous supporting and growth functions and the requisite diagnostics; and upgrading paths. To do this, Palecki identified and applied numerous innovative engineering solutions.

For example, most of the energy in an embedded system is traditionally spent at the box level; re-engineering the Printed Wiring Board interfaces to validate and perform. Rather than changing the entire card, and incurring the bother and expense of box-level certification and testing, the more innovative designer can leave the interface as is and keep the new receiver isolated from the weapons platform. This, essentially, is how AEGR is designed.

Under the AEGR program, designers isolated the change element, the receiver, from the Host MPU. The Host MPU does not detect installation of a new receiver because the AEGR core board translates data to the host's language. Adding a new NAVWAR receiver is simply a matter of removing the older receiver, inserting the new one, closing the unit, and porting the new software. No changing of ICDs or external features is required.

Research & Development (R&D) Contracting Innovations — AEGR

The Naval Center for Space Technology (NCST, Code 8100) of the NRL made

available an existing, competitively won contract, with an applicable Statement of Work (SOW). Other Army platform Project/Product Managers had experienced past success with the NCST contract vehicle. Most importantly, the NRL team had extensive knowledge of GPS, dating back to the early Cesium TIMATION satellites (the experimental predecessors of GPS) and first NAVSTAR launches. Currently, NRL is also involved with the GPS JPO's NAVWAR project, the technological response to the GPS Congressional mandate.

NCST used a competitive approach to contracting for non-specific hardware builds through innovative general purpose contract vehicles, the use of which they freely offer to other Services. The NCST support team is made up of more than 30 specialty engineering companies, with thousands of collective man-years of experience on the toughest problems. A customer PM need only identify the required hardware, software, or analytical profile required; negotiate a SOW and price; and move the money to begin. By competitively pre-selecting a large cadre of domain experts, combining them with the in-house, national treasure of more than 2,000 scientists and engineers, NRL can tackle and deliver solutions in the same amount of time it normally takes just to initiate and implement a dedicated, competitive contract instrument.

At the time of the AEGR program effort, NCST was already supporting U.S. Army PEO Aviation's navigation efforts. Since members of the U.S. Army Tank-automotive and Armaments Command Acquisition Center enjoyed a cooperative relationship with the U.S. Army Aviation & Troop Command (ATCOM) and NRL Acquisition Centers, they collaborated to leverage aviation experiences. Cardine was able to send Military Interdepartmental Purchase Request funds from PM Abrams to the NRL. The IPT then quickly drafted an AEGR SOW to ensure the NCST team – PM Abrams and the Abrams Prime contractor, GDLS – carefully defined all areas of responsibility. The AEGR scope was performance-oriented and incorporated all applicable Acquisition Reform initiatives.

GPS Engine

Trimble had an existing contract with HTI-quantity options, and the sponsor allowed Assurance Technology to secure the proper quantity for the R&D effort. Trimble also provided a considerable HTI economy-of-scale discount for the production quantities.

Abrams Tank

The SEP program had sufficient systems engineering scope to support the integration of the AEGR. Although no formal contractual instrument existed between GDLS and Assurance Technology, a "partnership" was formed to ensure seamless physical and functional integration of AEGR.

Production Contracting Innovations — Alpha Contracting

The TACOM Acquisition Center met with Assurance Technology Corporation to negotiate an Alpha contract for production. Government representatives from PM Abrams Engineering (Dunbar) and Procurement (Army Maj. Fred Roitz); the TACOM Armament & Chemical Acquisition and Logistics Activity (Tim Donohoe, Jim Thomas); and the Armament Research, Development and Engineering Center (Tony D'Agosto, Yui Lung, and Ka Yuen) spent two days at Assurance Technology's corporate headquarters and production facilities. This small team of negotiators was expert in program management; pricing and auditing; engineering, quality assurance and documentation; and contracting.

ALPHA contracting was a new experience for Assurance Technology Corporation. The contractor's team of negotiators realized every action was not only happening quite rapidly, but also permanently. They had to be fully empowered and fully prepared. They would continue to exercise the HTI economy-of-scale rates for the GPS engines, via a subcontract with Trimble. Using computer models, they drafted an SOW outline and cross-referenced it to a table of possible deliverables and a detailed Basis of Estimate, formulated with the Defense Contract Audit Agency-approved labor and materiel rates/scales. This way, contractors have speed and flexibility working for them as they interact confidently with the government team.

A mere two days later, the scope, specifications, terms and conditions, and deliverables were finalized. The draft contract consisted of a fixed price Contract Line Item Number (CLIN) for production of the AEGR cards, a parts supply CLIN, and a Time and Materials CLIN (cost plus) for engineering services. The PMO and Assurance Technology jointly created the contract to their mutual acceptance and agreement, and within two weeks, government procurement authorities ratified it.

A familiar cliché says, "Necessity is the Mother of Invention," but in this case, a better proverb might be "Hard Work is the Creator of Innovation." The right people with the right attitudes and a common goal found innovative solutions to numerous challenges. Undeniably, the keys to success, for this program, are Horizontal Contracting initiatives, Horizontal Technology Integration initiatives, and Acquisition Reform in support of good leadership and focused motivation.

Editor's Note: The author welcomes questions or comments concerning this article. Contact him at **barbara@assurtech.com.**

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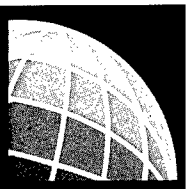
1. Vetronics are the electronic instrumentation, software, and control equipment used on ground-based vehicles and some weapons systems.

2. *Security Requirements for Use of Precise Positioning Service (PPS)*, CZE 93-105 (June 6, 1993).

3. An electronic bus is the electronic medium used to interconnect a number of circuit boards or electronic assemblies.



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THE JOURNAL OF THE DEFENSE ACQUISITION UNIVERSITY

ACQUISITION Review QUARTERLY

VOL. 6 NO. 3

The 1999 Annual Major Range and Test Facility Base (MRTFB) Review

Working Together + Speaking With One Voice = Success

NORENE L. BLANCH

People, processes, and facilities define the Test and Evaluation (T&E) infrastructure. The third element, facilities, covers 22 of the Department of Defense's (DoD) major T&E ranges and facilities. These multi-Service-user facilities include the Major Range and Test Facility Base (MRTFB) and provide "T&E support to DoD components responsible for developing or operating defense materiel and weapons systems."[1]

This enables DoD to "safely and effectively test the capabilities of a variety of advanced and highly capable weapon systems in environments representative of conditions found around the world."[2]

Training ranges are important because they offer the T&E community cost-effective opportunities for Operational Test and Evaluation (OT&E), while giving the warfighter an opportunity to operate the systems being tested under realistic conditions.[3]

Because of that importance, the MRTFBs came together for the 1999 Annual Office of the Secretary of Defense (OSD) Test Capability, Budget, and Investment Review held Aug. 24 - 26, Piney Point, Md.

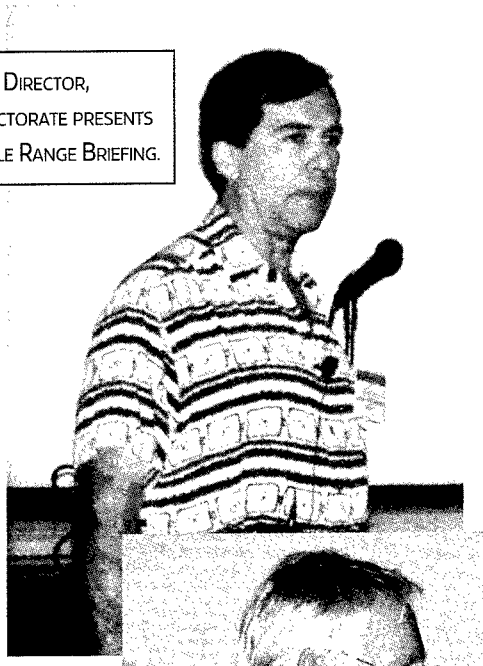
In a relaxed atmosphere, representatives from the MRTFBs briefed the OSD Director of Operational Test and Evaluation (DOT&E) Philip E. Coyle, on their organizations' operations, success stories, lessons learned, and issues of concern.

MRTFB Brief Adds Value

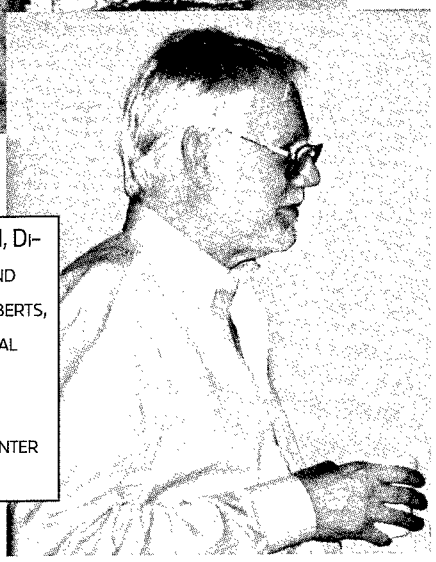
This was Coyle's fourth MRTFB review, and although many changes have occurred in the structure of OSD T&E since his first conference, he said, "One thing that hasn't changed in these four years is the value of these meetings."

Coyle places value on the MRTFB briefings because discussions and materials presented at the reviews benefit him throughout the year, helping him respond to inquiries, prepare reports, and talk to the military services, senior OSD officials, and Congress about range issues.

Coyle intends to use feedback from the MRTFBs to organize future conferences that meet the needs of the ranges and facilities and to ensure that this and future reviews will be as beneficial to the participants as to him. And this year, he has added a new feature that will help the MRTFBs view their work from a slightly different perspective – Operational Test Agency (OTA) involvement.



CHARLES R. GARCIA, DIRECTOR, MATERIEL TEST DIRECTORATE PRESENTS WHITE SANDS MISSILE RANGE BRIEFING.



FROM LEFT: PHILIP E. COYLE III, DIRECTOR, OPERATIONAL TEST AND EVALUATION, AND CARL E. ROBERTS, DIRECTOR, REDSTONE TECHNICAL TEST CENTER MEET PRIOR TO ROBERTS' BRIEFING ON THE REDSTONE TECHNICAL TEST CENTER INVESTMENT PROGRAM.

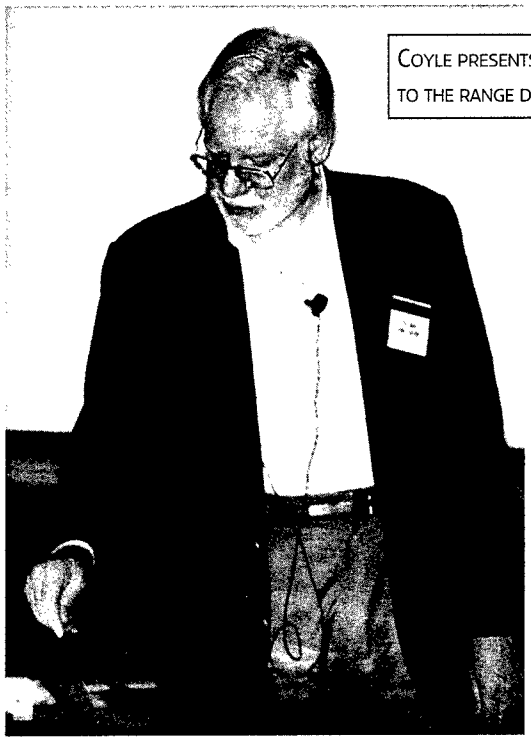
OTA Involvement

"This year I invited the Operational Test Agencies to come speak and participate," said Coyle. "I did that because it's really in the spirit of the reorganization of OSD Test and Evaluation."

Coyle explained the reasons why Under Secretary of Defense (Acquisition and Technology) Jacques S. Gansler reorganized the Office of the Secetary of De-

***Blanch** is an Editor, Visual Arts and Press Department, Division of College Administration and Services, DSMC.*

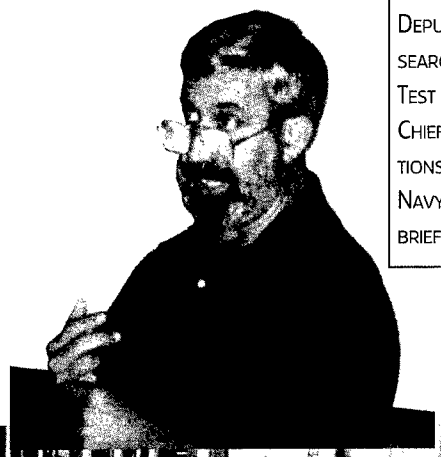
Photos by Jay Gould



COYLE PRESENTS OVERALL BRIEF TO THE RANGE DIRECTORS.

STEVEN K. WHITEHEAD, TECHNICAL DIRECTOR, COMMANDER, OPERATIONAL TEST AND EVALUATION FORCE (COMOPTEVFOR) PRESENTS THE NAVY OPERATIONAL TEST AGENCY BRIEFING.

GEORGE R. RYAN JR., DEPUTY DIRECTOR, RESEARCH, DEVELOPMENT, TEST AND EVALUATION, CHIEF OF NAVAL OPERATIONS PRESENTS THE NAVY/MARINE CORPS BRIEFING.



CONFERENCE ATTENDEES DURING THE DINNER BREAK.

fense (OSD) T&E. "The first [reason], was to bring much of OSD Test and Evaluation together into a single organization, but philosophically the thing that he [Gansler] was really after was to get operational testers and all testers involved early in the programs, helping them to solve problems much earlier. And so I wanted the Operational Test Agency commanders to be represented this week and have a chance to talk so that you can hear about their needs, so they can hear about your capabilities, and so that you both can work more closely together in the future."

THE "FACE" OF DOT&E

Coyle also invited action officers from his staff to attend the conference. He shared the success story of Live Fire Test and Evaluation's (LFT&E) move from the Office of the Under Secretary of Defense for Acquisition & Technology to his office, Operational Test & Evaluation (OT&E), almost five years ago.

Coyle refers to his action officers as, "the 'face' of DOT&E to the outside world," who depend on the expertise of James F. O'Bryon, DOT&E/Live Fire Test and Evaluation (DOT&E/LFT&E), and his staff for "advice, counsel, and policy direction," on Live Fire issues.

"Jim O'Bryon, arrived with very few people. He did not begin to have enough people to be able to assign them all to a

reasonable number of programs. My office tracks a couple hundred programs, and it just was not possible for him [O'Bryon] to put the same level of effort into Live Fire that we put into Operational Test and Evaluation, and so faced with that practical reality, we had our regular operational test and evaluation action officers take responsibility for also representing Live Fire to program managers."

The presence of Coyle's action officers will prove beneficial to the test ranges as they will be working together with the Service's Operational Test Agencies and with others on testing programs, usually at the test location. Coyle is asking his action officers to become advocates for range capabilities in an analogous way just as they have become advocates for LFT&E.

Where are we going?

"In the future, we are going to be looking at the composition of the MRTFBs and the policies that effect the MRTFBs," Coyle said. "I have also been invited to serve on the Board of Operating Directors; and with them we are going to be looking at whether there are ways to simplify the T&E committee structure." Coyle also added that the ranges can expect a requirement from Congress to do more studies in the future.

Cooperation with Defense Science Board (DSB) Studies

"As most of you are aware," said Coyle, "Congress has already asked for a new study on Test and Evaluation." Coyle is optimistic about the outcome of the study when coupled with hard work, and a close working relationship between the DSB and the T&E community.

He has been heavily involved in DSB activities in the past and believes, "When we work closely with the DSB, their study groups can be very helpful," and Coyle intends to continue to play an active role in cooperation with DSB studies.

OSD's Commitment to T&E Investments

Coyle concluded by describing himself as an "advocate for new investments" in test and evaluation. "And that isn't going to stop," he said. "That is something that I am going to continue to do; and to that end, I'm going to need your help in identifying where you think new investments are needed most."

OSD T&E Issues

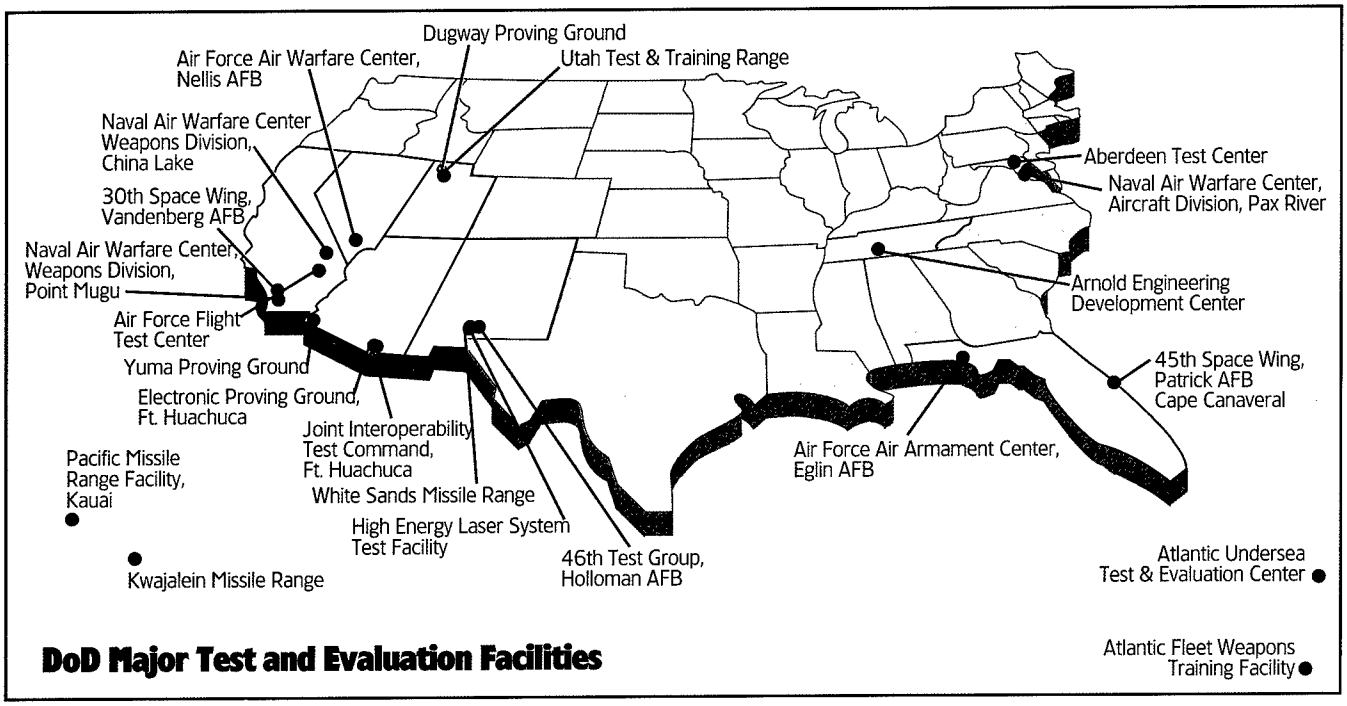
John F. Gehrig, Deputy Director, Operational Test and Evaluation/Resources and Ranges (DOT&E/RR), picked up where Coyle left off in a seamless transition as he discussed OSD issues with the attendees.

Gehrig echoed Coyle's words as he emphasized the value of the MRTFB review. He also stressed the benefits of Coyle's involvement with not only the DSB and the Board of Directors; but he also spoke about the importance of Coyle's participation on other boards and groups.

"The Director [Coyle] has picked up some very important responsibilities that I think are going to go a long way in helping us to defend the ranges. One of the most important things that's happening this year is that he has been invited to be a member of the Defense Resources Board, which is the organization in OSD that takes a look at the resources and looks at how the money is being spent.

"It is a very important board to be on if you want to have an influence on where money goes in OSD. Another organization that does a lot of work for the Defense Resources Board is the Program Review Group; and DOT&E also has representation on that, so I think that's one really big step toward getting us involved in the OSD funding picture," said Gehrig.

And adequate funding is needed to counteract the effects of 10 years of downsizing, which has taken its toll on T&E's MRTFBs.



DoD Major Test and Evaluation Facilities

Common Trends Affecting T&E's Infrastructure

Although the workload for the MRTFBs remains steady, most ranges continue to report drastic workforce reductions.

Between fiscal year 1987 and 1999, the MRTFB workforce decreased by 9,200 people. Since fiscal year 1990, the number of military personnel available for assignment at MRTFB facilities decreased 39 percent. By fiscal year 1998, civilian contractors accounted for approximately 53 percent of the MRTFB workforce. [4]

Not only have MRTFB managers seen the civilian workforce shrinking due to reductions-in-force, lack of promotion opportunities, and slow to non-existent hiring practices, but they have also noted an increase in the average age of these highly skilled government workers over the past 10 years.

The average age of these employees is 46 to 48 years old. The test ranges expressed great concern over this issue because not only is the civilian government workforce aging, but this age group is expected to retire almost simultaneously with little or no qualified replacements on the horizon to carry on where the older, more experienced federal employees are leaving off.[5]

So far, the ranges have managed to meet the demands of the warfighter despite the budget constraints that have led to the reduction in funding for T&E's infrastructure and personnel, but not without major changes to their processes.

The MRTFBs have initiated major process improvements: leveraging technology to improve the efficiency and productivity of their facilities; partnering with other government agencies, industry, and allies to leverage each other's facilities; and reengineering their business processes to improve performance and to provide more affordable testing through better business practices.[6]

Even with the implementation of changes to their business processes, the MRTFBs are still challenged with the need to invest and modernize facilities that are more than 30 to 40 years old.[7]

The MRTFBs have initiated major process improvements: leveraging technology to improve the efficiency and productivity of their facilities, partnering with other government agencies, and reengineering their business processes.

As the MRTFB commanders gear up for the 21st century, concern about future initiatives emerges. "In the future, weapon systems will be even more complex; they will have to be interoperable and function as a system-of-systems; they will be highly dependent on information and digitization; and they will be deployed under a broader and more dynamic set of conditions. Clearly we must have a more capable and robust infrastructure if we are to provide our warfighter with weapons that work."[8]

Have We Turned The Corner?

Gehrig painted a financial picture of DoD's budget as it relates to the federal budget. He spoke of a decrease in funding for both Defense and T&E.

"Have we turned the corner 'with a question mark?'" asked Gehrig. "And I'd say, that's about where we are right now. We are looking at some minor increases, but we're not sure we've turned the corner."

The MRTFB's funding has decreased about 30 percent over the past decade. Likewise, institutional funding is down $2.7 billion, and investments in modernization have taken some heavy hits and are down approximately 29 percent, reported Gehrig.

"But we have some good news this year. It looks like the Services are going to have a little bit more [funding] this year than they have had in the past, and I think this is important," stressed Gehrig. And funding is not the only challenge faced by the MRTFBs.

Inadequate funding greatly disturbs the balance of the three elements of the T&E infrastructure. Gehrig illustrated the effect that one element has on the other. "With the definition of infrastructure being people, processes, and facilities, if you have taken a lot of your infrastructure out of people and you try to improve your processes, you really need to improve your facilities or you are going to 'death spiral,' and that's the message that we have been trying to get out."

And with a 12-percent increase in funding for the purposes of investment and modernization expected by the Services between fiscal 2000 and fiscal 2005, "It seems that the MRTFBs have been somewhat successful in getting their message out," continued Gehrig.

"But we're really successful when we get the message out with one voice," he stressed. "With one voice from the ranges, one voice from the Service staffs, and one voice from OSD ... That is how we have had the most success, that is how we will continue to have the most success, and that is why we think it is a great step to have OSD on the Board of Directors where we can get together and speak with one voice."

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Curing the Software Requirements And Cost Estimating Blues

The Fix is Easier Than You Might Think

MAJ. MIKE NELSON, U.S. ARMY
JAMES CLARK • MARTHA ANN SPURLOCK

Software plays an ever-increasing role in the operation of Department of Defense (DoD) weapon systems; Command, Control, Communications, Computers & Intelligence (C4I) systems; and management information systems. As Figure 1 depicts, the size of software in today's DoD weapon systems is quite large, and due to the increasing digitization of the battlefield, the numbers will only increase. For example, since 1980 the Army's inventory of source lines of code has increased from approximately 5 million to over 100 million.[1] Not only is the size of our software increasing, but as Figure 2 illustrates, our dependence on software is also increasing.

Extrapolating from a September 1994 report released by the Electronic Industries Association,[2] by the year 2000 DoD is expected to spend approximately $45 billion a year on software development. However, according to Dr. Patricia Sanders, Director of Test, Systems Engineering and Evaluation, Office of the Under Secretary of Defense, Acquisition and Technology, in her 1998 Software Technology Conference keynote address, 40 percent of DoD's software development costs are spent on reworking the software. By the year 2000, this will equate to an annual loss of $18 billion. Additionally, a 1995 Standish Group survey,[3] resulting in 365 respondents and representing 8,380 software applications, produced the following results:

- 52.7 percent of projects were challenged, meaning they were completed

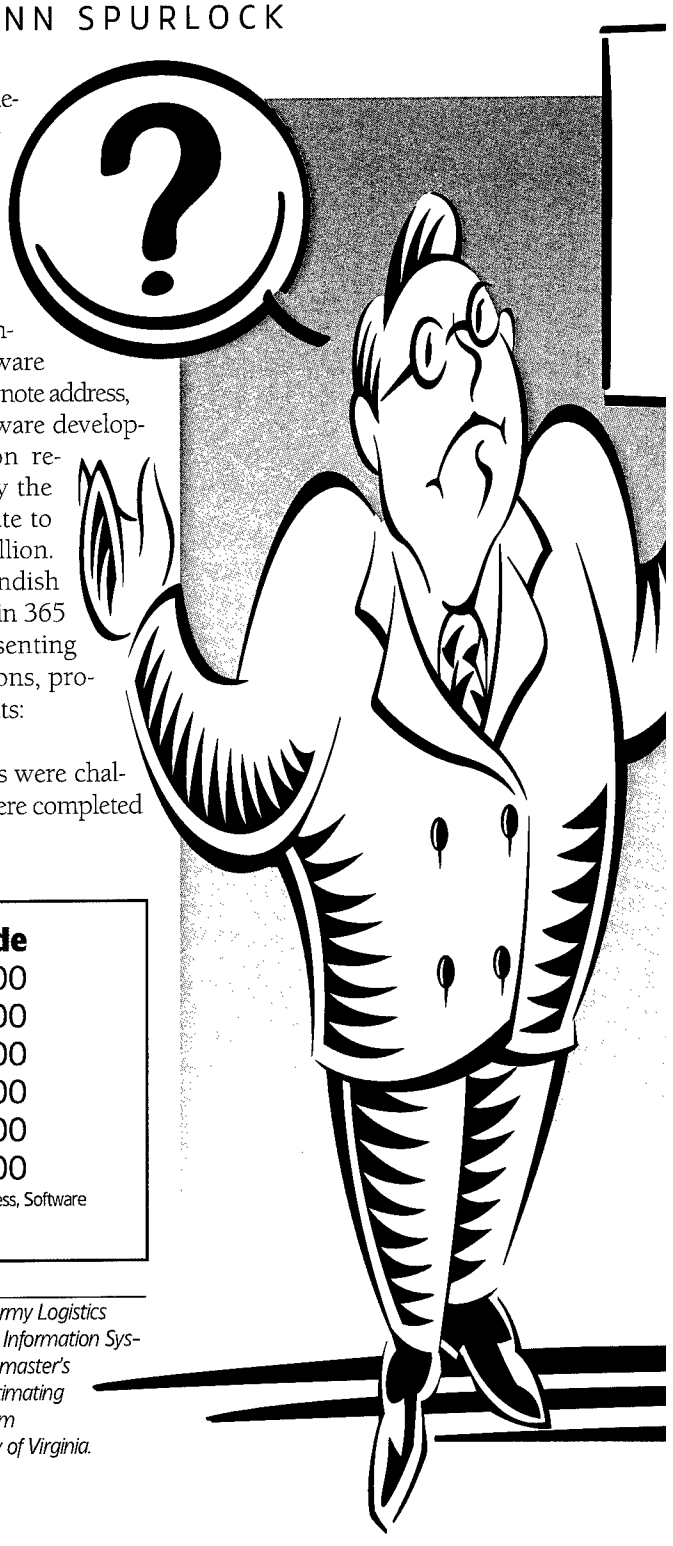

FIGURE 1. **Weapon System Software Sizes**

Weapon System	Source Lines of Code
M1 Tank	600,000
Scout/Cav	1,000,000
M2 Infantry Fighting Vehicle	1,560,000
Crusader	1,800,000
F-22	1,960,000
Aegis	2,840,000

Source: Dr. Delores Etter, Deputy Under Secretary of Defense, Science and Technology, Keynote Address, Software Technology Conference, 1999.

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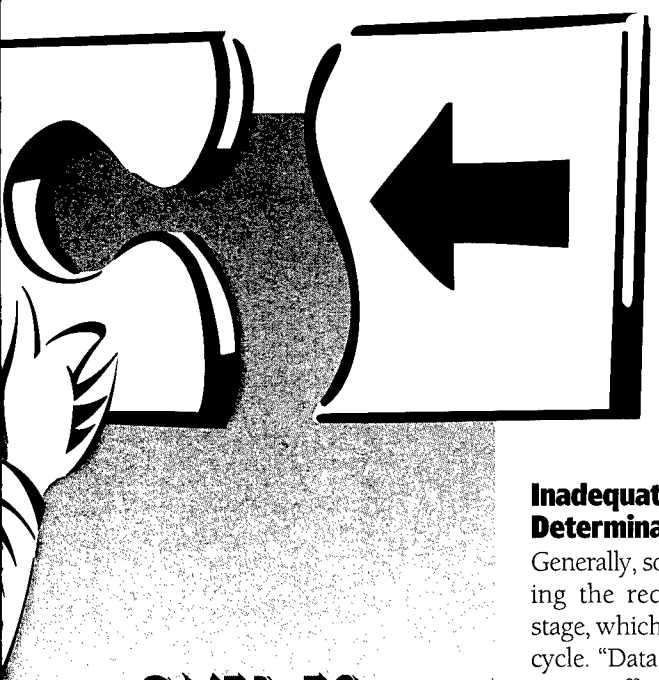
but incurred cost and schedule overruns, resulting in fewer features than originally specified.
- 31.1 percent of projects were canceled at some time during the development cycle.
- The average cost overrun for challenged and canceled projects was 189 percent of the original cost estimate.
- The average schedule overrun for challenged and canceled projects was 222 percent of the original time estimate.
- On average, challenged projects were delivered with only 61 percent of the originally specified features and functions.

Furthermore, Sanders stated that only 16 percent of software development projects would finish on time and on budget.



This article focuses attention on two major causes of software and cost estimating problems: inadequate requirements determination and inadequate software cost estimates. Besides focusing attention on these two important areas, we present readers proposed solutions to inherent problems associated with software requirements and cost estimating.

Inadequate Requirements Determination

Generally, software problems begin during the requirements determination stage, which starts in Phase 0 of the life cycle. "Data collected at Rome Laboratory (Griffiss Air Force Base, New York) indicate that over 50 percent of all software errors are 'requirements errors.'"[4] The majority of the time, software developers are designing and developing software based on faulty requirements, which, in turn, results in the developers producing software that does not satisfy users' needs.

A 1994 survey conducted by IBM's Consulting Group found that 88 percent of the large software-intensive systems being developed by 24 leading companies, "had to be substantially redesigned."[5] This repeating problem results in 40 percent of DoD's annual software development dollars, or a whopping $18 billion spent on reworking the software. Furthermore, DoD knows from experience that correcting software errors follows the "1-5-100" rule.[6]

For example, a software error costing a mere $1 when caught early in the life cycle, costs $5 to correct at midpoint and $100 to correct later in the life cycle. What can DoD do to solve this problem?

We believe the user representative must prepare a Users' Functional Description (UFD) prior to Milestone I for all software-intensive systems, which includes all automated information systems, all C4I systems, and most, if not all, of today's major weapon systems. According to U.S. Army Training and Doctrine Command Pamphlet 71-9, *Force Development Requirements Determination*, August 1998, the UFD is intended as a refinement of the operational requirements for information technology (IT) capabilities contained in the Operational Requirements Document. As such, the UFD is the user representative's tool for effectively and completely communicating IT requirements to the program manager (PM).

The power of the UFD lies in its use of Integrated Computer Aided Manufac-

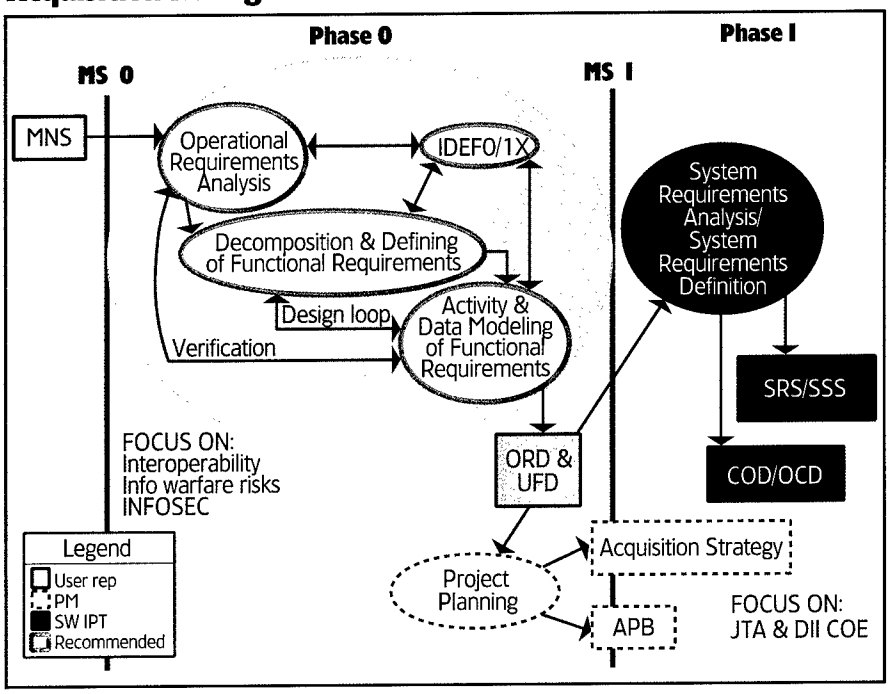
OVER 50 PERCENT OF ALL SOFTWARE ERRORS ARE "REQUIREMENTS ERRORS."

FIGURE 2. **Weapon System Software Dependencies**

Weapon System	Year	Percent of Functions Performed in Software
F-4	1960	8
A-7	1964	10
F-111	1970	20
F-15	1975	35
F-16	1982	45
B-2	1990	65
F-22	2000	80

Source: U.S. Air Force, "Bold Stroke" Executive Software Course, 1992.

FIGURE 3. **Proposed Phase 0 Activities for Software Acquisition Management**



Source: Jim Clark and Army Maj. Mike Nelson.

turing Definition (IDEF) models to communicate IT operational requirements to the PM. Using the Army format as an example, the user representative describes the functions and activities that IT must perform for the user community via the Joint Technical Architecture (JTA)-mandated IDEF0 activity modeling process, which is the version of IDEF that applies and defines the standard activity modeling. The user representative also describes data requirements necessary to support the functions and activities using the JTA-mandated IDEF1X data modeling process, which is the version of IDEF that applies and defines the standard for data modeling. (For more information on IDEF0 and IDEF1X modeling, refer to Federal Information Processing Standards, Publications 183 and 184 respectively.)[7]

The problem within the Army, and perhaps most of DoD, is the requirement to prepare the UFD is left to the discretion of the user representative. DoD guidance concerning the use of modeling to define user requirements is contained in the JTA and the Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) Architecture Framework. According to the JTA, if activity or data models are going to be developed for a system, then they must be developed in accordance with the IDEF0 and IDEF1X standards respectively. The C4ISR Architecture Framework identifies activity and data models as nonessential supporting framework products. Therefore, no mandate exists for the user's representative to apply these modeling techniques to better define the operational requirements and communicate them to the PM! Herein lies the crux of the problem.

A Step in the Right Direction

DoD has taken a step in the right direction by adding a required modeling and simulation element to the acquisition strategy in the proposed Change 4 to DoD 5000.2-R.[8] However, this action alone will not solve our inadequate requirements determination problem.

The acquisition strategy is prepared by the PM, but the PM is not responsible for defining the operational requirements. The PM is responsible, with the help of the user representative, for converting the operational requirements into system requirements that satisfy as many of the operational requirements as possible without violating the "building codes" mandated by the JTA and the Defense Information Infrastructure Common Operating Environment. The PM's use of modeling and simulation during the system requirements analysis process [software terminology] should prove very useful in converting operational requirements into system requirements. But, if the user representative fails to properly communicate operational requirements to the PM, system requirements will be converted incorrectly. The old computer adage of "garbage in equals garbage out" becomes a reality.

Hence, the requirement to use modeling and simulation during requirements determination needs to be moved back to the operational requirements analysis process in the form of a UFD. As depicted in Figure 3, the IDEF0 and IDEF1X models contained in the UFD provide the bridge between Phase 0-developed operational requirements contained in the Operational Requirements Document, and Phase I-developed system requirements documented in the System Requirements Specification and the Concept of Operations Description. We believe the absence of this bridge is the cause of the inadequate requirements determinations.

RECOMMENDATION

We recommend that a requirement, mandating the user representative prepare a UFD prior to Milestone I, be added to DoDD 5000.1,[9] along with a standard format for its preparation.

Our proposed strategy will also provide the PM with information needed to prepare the initial software cost estimate required at Milestone I as part of the overall acquisition strategy and the acquisition program baseline. Coupled with our proposed mandate for user representatives to prepare UFDs is the implied mandate for DoD to provide them with the personnel and training necessary to make the mandate a reality. A less preferred alternative to training and staffing user representatives to perform this critical function is DoD funding for outsourcing or privatization of UFD development.

Of course, the recommendations discussed here call for an aggressive investment of money and effort. However, the potential return on these investments, which includes annual cost savings of $18 billion, makes these recommendations well worth consideration.

Inadequate Software Cost Estimates

According to Dr. Delores Etter, Deputy Under Secretary of Defense for Science and Technology, half of all DoD software projects end up costing twice as much as originally estimated.[10] Why? We find two major reasons.

The first reason is incorrect software size estimates. The key to developing accurate software cost estimates is correctly estimating the size of the software. Since the PM determines size of the software based on the users' requirements, why are our software size estimates incorrect? Three reasons invariably surface:

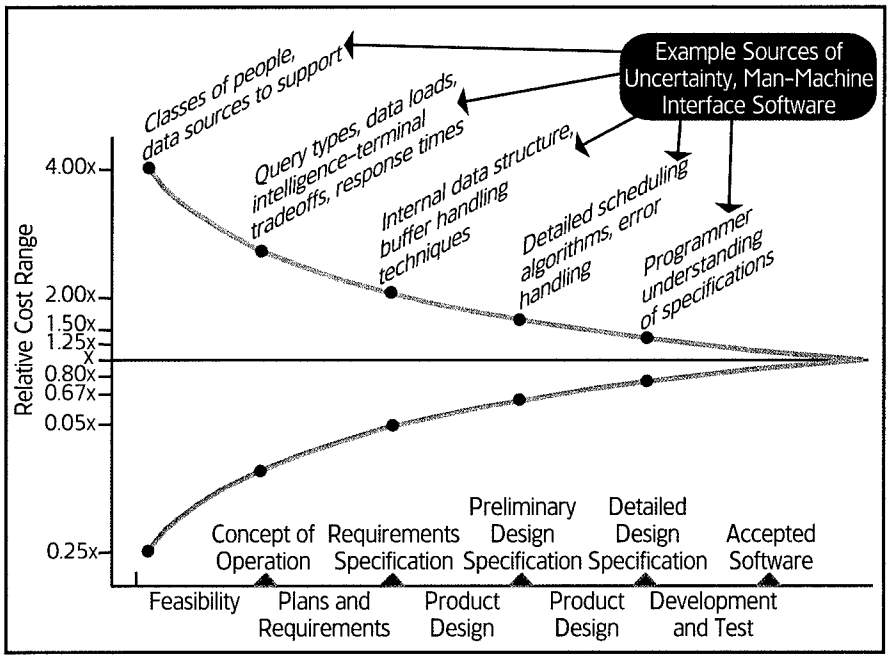
- User representatives are incorrectly and incompletely defining requirements.
- Program managers are using the wrong software size measure.
- A lack of training pervades DoD in the areas of software sizing and cost estimating.

Now that we have discussed and offered a solution for the problem of inadequate requirements determination, we will focus next on the problem of using the wrong software size measure, followed by a discussion on the lack of software sizing and cost estimating training.

Software Size Measure

In the past, most parametric models determined software costs based on an estimated number of source lines of code. Figure 4 vividly depicts the extremely high error rate (up to 400 percent) associated with estimating software costs, using source lines of code-based parametric software models, early in the life cycle. The problem lies not with the accuracy of the algorithms in the models, but with the inaccuracy of the size measurements fed into the models.

FIGURE 4. **Typical Accuracy of Source Lines of Code-Based Software Cost Estimation by Development Phase**



Source: Barry W. Boehm: Software Engineering Economics.[11]

THE [ERROR RATE] PROBLEM LIES WITH THE INACCURACY OF THE SIZE MEASUREMENTS FED INTO THE MODELS.

Why have source lines of code proven to be an ineffective software size measure early in the life cycle (Phase 0/Milestone I)? Careful examination reveals several reasons:

- Programming languages have varying numbers of instructional units used to process a command. For example, to execute a command in Ada might require several hundred source lines of code, while the same command in C++ could require only several source lines of code. Further complicating this issue is the fact that prior to Milestone I, when the initial software cost estimate is being developed, the programming language(s) is not yet determined.
- Source lines of code estimates are based on a technical or physical view of the system, which does not exist at Milestone I. While historical source lines of code counts may be available from prior projects, their reliability is suspect, especially if the development language(s) is different or unknown.
- No standard definition or method exists for measuring source lines of code.

A more appropriate software size measure, at least in the early phases of the life cycle, is function points (FP). Function Point Analysis (FPA) is a method for determining software size based on function points, which A. J. Albrecht of IBM first introduced in 1979. Today, the nonprofit International Function Point Users Group (IFPUG) upholds the FPA methodology.

The FPA method boasts a high success rate and is compatible with the Institute of Electrical & Electronics Engineers/

Electronics Industries Association 12207, an industry implementation of an international standard for software life cycle processes; International Organization for Standardization/International Electrotechnical Commission 15504, an international standard for software process improvement practices; and several commercially available software cost estimating models. FPA is concerned with determining the number of logical, i.e., user identifiable, external inputs, external inquiries, external outputs, external interface files, and internal logical files that the software will contain. Each instance of these function types is assigned a standard number of FPs based on its class and complexity. The FPs are then totaled to determine the size of the software.[12]

The beauty and power of FPA is that each of these five function types maps directly to the information contained in the IDEF0/1X models that the user representative would provide to the PM.

In other words, the IDEF0/1X models provide all the information required for determining the initial FP count of the software to be developed. This FP count then becomes the size measurement that can be fed into an FP-based parametric model, which, in turn, produces the software cost estimate in terms of work effort and cost. Because FPA is based on a functional or logical view, instead of a technical or physical view of the system, it also allows the PM to accurately quantify software size in terms the user representative and the program manager can understand.

Currently, the majority of DoD software cost estimates are not derived using FPA, and few, if any, DoD cost estimators are IFPUG-Certified Function Point Specialists. The Army's Cost and Economic Analysis Center, and DoD's Cost Analysis Improvement Group, reported only a few software-intensive systems used FPA as the basis for deriving software cost estimates. Unfortunately, the majority of software cost estimates continues to be based on source lines of code, and will experience the problems discussed earlier.

RECOMMENDATION

We recommend that DoD discontinue using source lines of code and begin using FPs as the Department's primary software size measure.

The number of source lines of codes contained in the weapon systems listed in Figure 1 indicates the large majority of Acquisition Category I/IA programs contains between 10,000 and 100,000 FPs. According to Capers Jones, Chairman of Software Productivity Research (SPR), the average cost per FP for military systems with 10,000 and 100,000 FPs is $11,232 and $16,161, respectively.[13] Considering that, we simply can not afford to continue source lines of code "guesstimating" to approximate size of the software in these systems. Nor can we rely on DoD contractors to provide the sole software size estimate. User representatives must accept the responsibility to accurately and completely define IT requirements of systems; likewise, PMs too must assume responsibility for converting IT requirements into accurate and complete software cost estimates.

According to Mike Cunnane, SPR, an experienced IFPUG-Certified Function Point Specialist could count 1,000 FPs per day. Based on the government rate of $1,573 per day, hiring one of SPR's IFPUG-Certified Function Point Specialists to count the FPs for a 10,000-FP system would cost approximately $15,730. Keeping in mind that source lines of code-based software cost estimates for a system this size can be off by as much as $84 million (as depicted in Figure 4), $15,730 would seem a bargain price for obtaining an accurate software size measurement.

An added benefit of using FPA is its well-defined status and recognition as an internationally governed unit of measure. Essentially it provides a common language for the PM to communicate the size of the effort to prospective contractors. Invariably, programming languages will differ in the number of source lines of code required to perform the same function or to execute the same command. Contractors also will differ in the programming languages they use. One contractor might favor C++, another Ada, and a third, Visual Basic. The waters are further muddied by the fact that no universally accepted standard definition exists for a source line of code.

FPA also provides an established set of rules for applying its internationally governed unit of measure, which is completely independent of the programming language or database management system used to develop the software. Based on the 1990 Massachusetts Institute of Technology study conducted by C.F. Kemerer, given the same set of requirements, the FP counts provided by the government and contractor IFPUG-Certified Function Point Specialists, should be within 10 percent of each other.[14] The results of the study were based on the 1990 IFPUG CPM Release 3.0, which had many fewer clarification and counting rule examples than the current IFPUG CPM Release 4.1.

Therefore, as Carol Dekkers, President of IFPUG, recently stated, "It is absolutely logical to conclude that if the study were done today with the IFPUG 4.1 rules, that the conclusions would be the same, but with much greater accuracy." FPA puts everyone on the same level playing field. With common agreement on the size of the software, the PM's task essentially becomes evaluating which contractor can produce the required FPs with the least number of defects for the least amount of money.

Why are we doing so poorly in estimating our software costs? Today, the availability of training is certainly no excuse because the Defense Acquisition University (DAU) provides such training. The basis for this training requirement is not in guidance, but in law! Congress passed the Defense Acquisition Workforce Improvement Act (DAWIA) of 1990 because it tired of hearing bad publicity about DoD on "60 Minutes," in *The Washington Post*, and from other media.

Immediate Need For Cost Estimating Training

Since 1995, DAU has sponsored a two-week course in Software Cost Estimating (BCF 208). To our knowledge, this

is the only DoD-sponsored course covering software cost estimating in detail. Other DAU courses (ACQ 201, Intermediate Systems Acquisition Course; IRM 101, Basic Information Systems Acquisition Course; BCF 101, Fundamentals of Cost Analysis) touch on software cost estimating, but BCF 208 covers the full range of software acquisition management and software cost estimating, addressing FP- and source lines of code-based parametric models.

DoD students may attend DAU courses tuition-free, while contractor personnel employed under a current contract with the government can attend BCF 208, Software Cost Estimating, for the current rate of $66.00 per day.

Expense, or lack of available training, are not realistic excuses for not "growing" our own quality software cost estimators. Perhaps because the training is considered an "elective," too few people view it as career-enhancing.

RECOMMENDATION
We recommend software cost estimating training, such as BCF 208, be mandatory for DAWIA certification for all individuals involved in acquisition career fields such as Program Management; Business, Cost Estimating, and Financial Management; and Computers and Communications; as well as for individuals working combat development issues.

To date, 310 students, representing the budgeting, contracting, and auditing communities, have attended BCF 208. Certainly, practitioners in these career fields require training in the software cost estimating process, but personnel working in other functional areas and career fields also need to be part of the software cost estimating process. Understandably, estimating software costs can be a difficult, daunting challenge for those not well-versed in software issues.

The Software Technology Conference (STC), DoD's premier annual conference on software, did not offer a cost estimating track in past conferences. STC should not miss another opportunity to provide this critical training during the next conference, scheduled for May 2000 in Salt Lake City, Utah.

The second major reason why half of all DoD software projects end up costing double the original estimate, and why DoD software projects suffer an average schedule slippage of three years,[15] is requirements instability. In other words, once the software size estimate is determined, its stability is tenuous at best. Three major factors emerge as the culprits: requirements creep, technology insertion, and regulatory changes.

THE MAJORITY OF SOFTWARE COST ESTIMATES CONTINUES TO BE BASED ON SOURCE LINES OF CODE, AND WILL EXPERIENCE PROBLEMS.

Requirements Creep

Internal and external forces generate requirements creep. If the user representative fails to determine completely and accurately the requirements up-front, then this internal force will add new and change existing requirements throughout the development of the software. A system required to interface with another system experiences externally generated requirements creep every time the other system changes either its technical or functional external interface requirements.

Technology Insertion

Technology insertion has a software component as well as a hardware component. For example, almost all of DoD systems are today running on a commercial operating system. As vendors release major upgrades to their operating systems, they stop supporting their previous versions. The PM must then either purchase a very expensive maintenance contract, somehow start internally maintaining the current version of the operating system, or upgrade to the vendor's new version of the operating system. Upgrading often means the PM must reconfigure the software so it operates properly and efficiently with the new version of the operating system. At a minimum, the PM must conduct extensive testing to ensure the software still functions correctly. Inevitably, the problem multiplies as the PM must integrate more and more commercial-off-the-shelf products into the software inventory.

The hardware side of this coin is not much different. Peripheral devices, such as printers, scanners, and barcode readers require software drivers to operate properly. These devices may also contain non-modifiable firmware, wholly incompatible with the current system, which, in turn, forces the software developer to change the application software so it too functions correctly with the new device. Major hardware platform upgrades or changes can require extensive testing to ensure the software functions normally, with no residual adverse effects.

Regulatory Changes

Regulatory changes are probably the most overlooked reason for requirements instability, but they have a big impact, especially on management information systems. DoD management information systems usually implement the business processes for a specific functional area, such as finance, supply, maintenance, and property accountability. Regulations define and govern these business practices, processes, and procedures. What happens when the "powers that be" decide to change the regulation within a certain functional area? Obviously, the software within the management information system that implements that regulation must also be changed.

Is there a solution to the problem of requirements instability? Some would argue it remains doubtful that this problem can be, or even should be, solved. However, DoD can certainly take steps to alleviate the adverse cost and schedule impacts caused by requirements instability.

RECOMMENDATION
We recommend DoD apply the industry-proven and accepted rule-of-thumb for requirements growth to all of its initial software cost estimates.

According to Jones, "The average growth of unplanned, unanticipated requirements is about 1 percent to 2 percent per month during the design and coding phases of typical software projects."[16] A 1-percent-per-month growth in requirements is also supported by the results of the recent study conducted by Jeff A. McDowell and Dr. Lewis S. Fichter of Tecolote Research, Inc., which they presented at the 1999 Software Technology Conference.

For example, consider a 10,000-FP software project, which we estimate will take 36 months to develop. (The 36 months does not include installation or fielding of the system.) Using the figure of $11,232 per FP, the initial software cost estimate for development of the project comes in at $112,320,000. Spread over a 36-month period, it equates to a staff productivity of 278 FPs per month. However, if the worst-case, 2-percent-requirements-growth rule-of-thumb is correct, this project actually ends up at 17,200 FPs, a cost of $193,190,400, and will take approximately 62 months to develop. By failing to consider the inevitable growth in requirements, our original estimate for this project almost doubled in cost, and the schedule slipped 26 months.

RECOMMENDATION
Using this same example, we recommend the following strategy for addressing unplanned, unanticipated requirements. Baseline the contract for the development of the project at 17,200 FPs, 62 months, and $193,190,400. However, since the requirements for the additional 7,200 FPs currently do not exist, hold them in management reserve. As new requirements come in, the PM sizes and prioritizes them, and then withdraws the appropriate number of FPs from the management reserve and passes them on to the contractor for development.

For the contractor to meet the original schedule, the PM must still establish a deadline for the incorporation of new requirements. This technique gives the PM much more latitude in dealing with the adverse effects of requirements instability on the cost and schedule of a project. By incorporating the requirements growth rule-of-thumb into the initial contract baseline, the PM can shift the deadline for incorporating new requirements much further to the right on the project's calendar, without affecting the project's original cost or schedule. Not only does this technique generate more accurate and realistic cost estimates, but it also gives PMs the flexibility required to better satisfy changing needs of their customers.

Now is the Time

The time for change is now as DoD continues losing $18 billion per year reworking its software, while only 16 percent of its software development is completed on time and within budget. To reverse this trend, DoD must do a better job defining operational requirements, estimating the size of the software, and cultivating well-trained software cost estimators. The training is available; the need is substantial; the timing is right.

Editor's Note: For questions, comments, or a copy of the references cited in this article, contact Nelson at **nelsonm @lee.army.mil.**

DoD Selects Vendors for Public Key Infrastructure Pilot

The Department of Defense has made its initial selection of vendors to enable secure, electronic business services with private industry.

Operational Research Consultants Inc., and Digital Signature Trust Co. are the first two candidates selected to supply the Department with Class Three Interim External Certification Authorities [IECA] for its public key infrastructure. This capability will allow DoD to electronically communicate with industry by enabling secure, private electronic business and paperless contracting. IECAs will be used to provide non-DoD personnel with certificate services compatible with the Department's public key infrastructure.

In May 1999 the Department released a solicitation for IECAs to support vendors conducting business with the Paperless Contracting Wide-Area Work Flow, Electronic Document Access, and Defense Travel System applications. Operational Research Consultants Inc., and Digital Signature Trust Co. are the first two candidates to successfully complete the testing, policy, and procedural requirements for IECAs. More IECA selections will be announced, as available.

Selection of these two vendors is a significant milestone in the rollout of the Department's public key infrastructure since it promotes broader industry participation. In addition, this pilot should provide additional data to refine the Department's requirements and procedures for use of future external certificate authorities.

Editor's Note: This information, published and released Sept. 21 by the Office of the Assistant Secretary of Defense (Public Affairs), is in the public domain at **http://www.defenselink.mil/news.**

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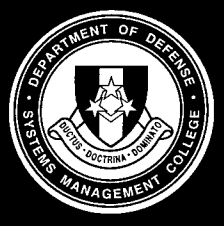

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Army Knowledge Online Provides Information Multiplier

GERRY J. GILMORE

WASHINGTON (Army News Service) – In a month or so, authorized users will be a mouse click away from accessing the Army's internal Web site.

When established, "Army Knowledge Online," the Army's Intranet, will give active-duty and reserve soldiers, Department of the Army civilians, retirees, and other authorized users a secure, computer-accessed ability to communicate worldwide and obtain access to a storehouse of information, said AKO Program Manager Maj. Charles A. Wells.

Currently undergoing testing, AKO was developed by the Army's Strategic and Advanced Computing Center in the Pentagon, which falls under the Office of the Director for Command, Control, Communications, and Computers.

The concept of AKO was initiated in 1996, said Wells, by then-Army Chief of Staff Gen. Dennis J. Reimer.

"AKO began as a communications project up in the General Officer Management Office [in the Pentagon]," said Wells. "General Reimer used it to collaborate with his general officers; they could E-mail each other and conduct online 'chats.'

"The senior Army leadership liked the system so much that they wanted to use it for the whole Army."

The vast majority of AKO content, said Wells, is servicemember-specific, linked to worldwide Army command home pages. Authorized users will be able to log on and electronically "surf" for information, such as the quality of life at future duty stations, to include local attractions, cost-of-living and schools. A plethora of other information, such as weather, travel, and Service news would also be available.

"When you see the site, the content will be 'Army content,'" said Wells. "This won't be information we've thought up and put on the system ... we're collecting information to be made available at one location for internal consumption.

"We've had the public Web site, the Army Home Page, which basically tells the Army story to the world, for quite awhile ... AKO is the other side of the coin; it is the Army's 'private' Web site, which provides Army-specific information for the Army."

Wells said AKO also includes an internal, computerized, combination address/phone book/"yellow pages" information directory for soldiers and other authorized users.

"One of its features is a 'people search' to locate and contact other soldiers and DA civilians," he said. "You can also search all Web servers in the army.mil domain to look for information and documents," he said. "This is a knowledge-management project, and that knowledge comes from people."

AKO will also enable users to share knowledge quickly via encrypted E-mail accounts, said Wells. In a smaller and much-deployed post-Cold War Army, that ability becomes invaluable.

"Why are we doing this? Well, yesterday we had a very straightforward threat; we knew who the enemy was, and we had a lot of detailed plans to stop an attack in central Europe. Today we are faced with a variety of challenges ... everything from regional instabilities, economic dangers, and the proliferation of weapons of mass destruction. How are we going to accomplish all of these missions with a much-smaller force?

"The senior Army leadership sees knowledge management as a key tool to accomplish that. We can work more effectively with fewer personnel. As soldiers travel to new jobs around the world, we can have more continuity within the

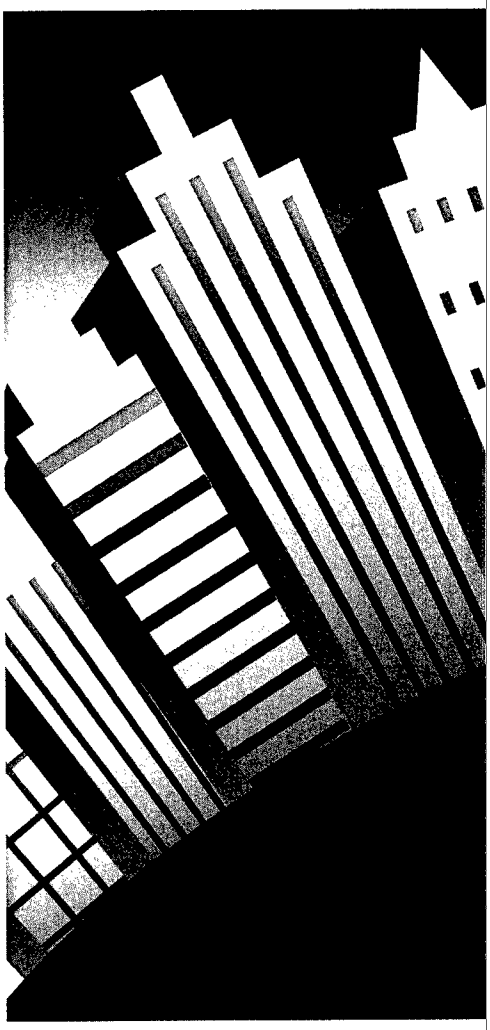


Image © 1999 EyeWire, Inc.

Released Sept. 10, 1999

Army if they share their knowledge with others. We want to capture knowledge from that soldier who has been on the job for 18-24 months and share it with the rest of the Army," he said.

That shared knowledge, however, could be of interest to those who would use it to the Army's disadvantage, such as espionage agents, said Wells. That, he said, is why AKO will be a safeguarded, protected and monitored information conduit.

Contrasted with the current Army Home Page, which is open to the general public through the Internet, Wells said AKO is available only to those with an Army-approved user ID and password.

"In order to get to The Army Portal [for AKO] you have to get an account [consisting of] user ID and password. In order to qualify for that, you have to be working for the Army as an active duty or reserve component soldier, as a DA civilian, a retiree, and some contractors on a case-by-case basis," he said.

There are currently 27,000 registered users for AKO, said Wells, who noted that for the past two years the system has been in limited usage for general officers, other senior leaders, and selected officer year groups using the site for Career Field Designation.

Wells said AKO would expand to 50,000 [users] in Fiscal Year 2000. When The Army Portal debuts in the next few weeks, it will provide additional features such as the ability for users to individually 'tailor' their site by placing preferred topics 'up front' on the page.

"If I decide, in order to help me do my job, that I need to obtain the latest information about Fort Huachuca and Bosnia over a period of time, I can customize my page to always have this information," said Wells.

AKO is "a communication, collaboration, and interaction vehicle," said Lt. Col. W. Addison Woods, the director of the Army's Strategic and Advanced Computing Center in the Pentagon.

"We have a lot of really great web sites and knowledge management efforts around the Army," he said.

"One central [AKO] portal at the headquarters level gives us the capability to harness all of that good work to make it an information multiplier for the Army community." Wells said AKO users would be able to log on at home or at work.

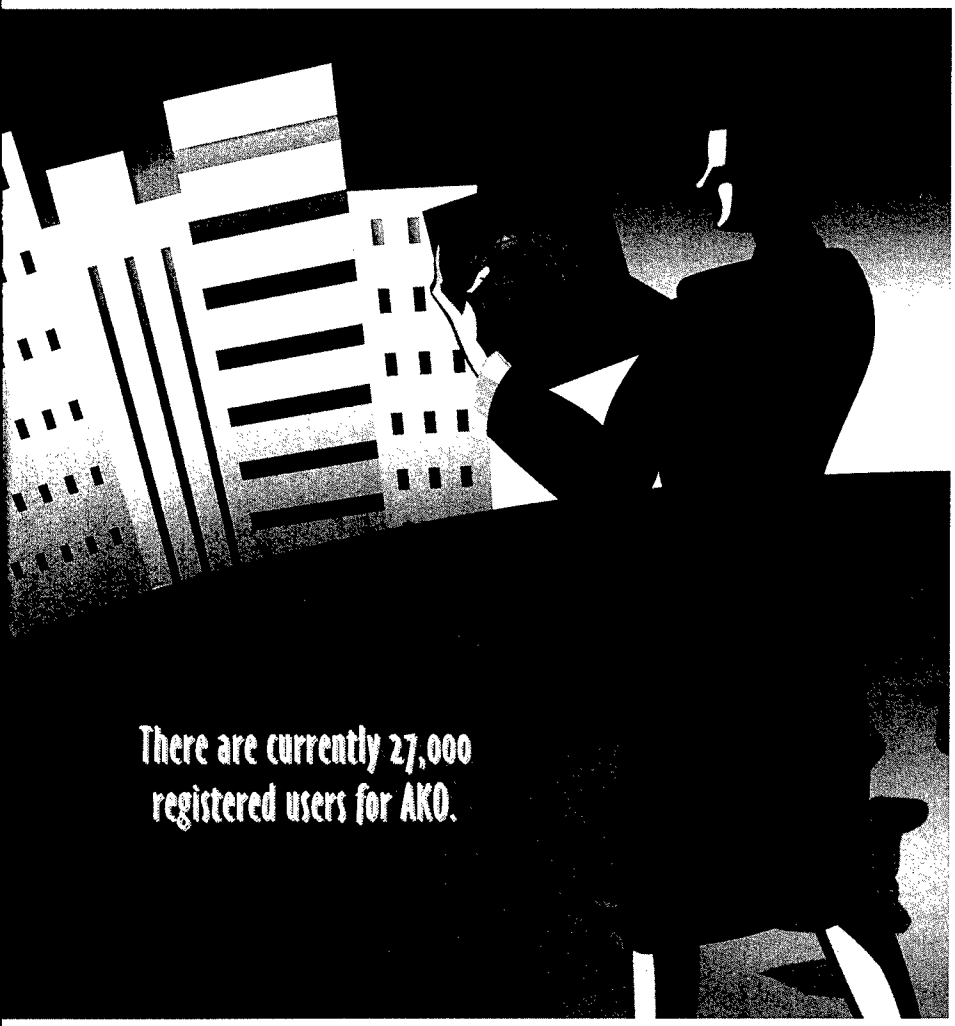
"When I log on at my house, or anywhere in the world, I'll get the same [AKO] page, and it is all protected, using encryption and the user ID and password," he said.

Harnessing the benefits of knowledge management via AKO enhances readiness, said Army Webmaster Christopher Unger.

"We've gotten a lot of benefit by training enroute to a mission; we are now communicating enroute, so when you PCS, you are not 'out of the loop' for that week or so," said Unger. "You can check your Army [AKO] E-mail on your laptop or on a friend's computer.

"To be able to communicate at all times gives the Army a tremendous amount of flexibility. Informational awareness is just as important in the institutional (headquarters) Army as informational dominance is for warfighters on the battlefield," he concluded.

Editor's Note: This information is in the public domain at **http://www.dtic.mil/armylink/news.** For more information about "Army Knowledge Online," visit the public Web site at **http://www.army.mil/ako** or to apply for an AKO account, go to **http://www.us.army.mil** and click on "I'm a new user.")



U.S. ARMY PUBLIC AFFAIRS NEWS RELEASE

Army Acquisition Leadership Awards Announced

The Honorable Paul J. Hoeper, Assistant Secretary of the Army for Acquisition, Logistics and Technology, is pleased to announce the five winners of the Acquisition Leadership awards for Fiscal Year 98. The recipients received the awards for their significant contributions to the Army Acquisition Community and Department of the Army.

Project Manager of the Year

Col. Jeffrey Sorensen, Project Manager-Night Vision, Reconnaissance, Surveillance and Target Acquisition (PM-NV/RSTA), received the Project Manager of the Year Award. Sorenson was cited for using his acquisition management and Certified Public Accountant skills to the fullest. He expertly managed four separate Army accounts; Aircraft Procurement Army; Other Procurement Army; Research, Development, Test and Evaluation (RDT&E-6.3 and 6.4); and Weapon Tracked Combat Vehicles. He met or exceeded all Headquarters, Department of the Army obligation goals.

Product Manager of the Year

Product Manager of the Year went to **Lt. Col. Stephen R. Kostek,** Product Manager, Joint Tactical Terminal Common Integrated Broadcast Service Modules (PM-JTT/CIBS-M). Kostek was cited for his compelling vision, ability to translate that vision into a program plan, and ability to implement his plan, which produced dynamic Operations and Support (O&S) savings and a 63-percent cost reduction for the JTT program. He also initiated [a] modeling and simulation program to address risk mitigation, resulting in teaming trade-off decisions to resolve processor loading and through-put issues.

Acquisition Commander of the Year

Col. Ronald C. Flom and **Lt. Col. Mary K. Brown** were each the recipients of the Acquisition Commander of the Year Award for FY 98. **Flom** was recognized for his achievements as the Commander, Defense Contract Management Command (DCMC) – Baltimore. He superbly managed the largest and most complex field command within DCMC with 27 percent of all contracts, to include 30 percent of the command's large (over $100,000), flexibly placed contracts, with over 7 percent of the manpower in geographic Contract Administration Offices [CAO]. **Lt. Col. Brown** was recognized for her achievements as the Commander, Cold Regions Test Center (CRTC), Fort Greely, Alaska, the DoD's only natural, cold weather test center. **Brown** has been instrumental in ensuring that CRTC is an integral part of the global test community by initiating programs to include CRTC in the Virtual Proving Ground and developing low-cost, long-term partnerships with other organizations.

Contingency Contracting Award

Col Donald R. Yates was honored with a Contingency Contracting Award for his demonstrated excellence as Conmmander, U.S. Army Contracting Command Europe, and [Principal] Assistant responsible for Contracting, U.S. Army Europe, while supporting the Balkans' mission.

Editor's Note: This information is in the public domain at **http://www.dtic.mil/armylink/news.**

AIR FORCE NEWS SERVICE

Top Air Force Acquisition Official Discusses Vision for Next Century

WASHINGTON (AFPN, Oct. 20, 1999) – The Air Force's Assistant Secretary for acquisition recently talked about future acquisition challenges and the steps the Service must take to smoothly transition into the 21st century.

"To meet the challenges of 21st century acquisition, Air Force acquisition must be tailored to meet a broad range of options," said Dr. Lawrence J. Delaney, who was sworn-in to the top Air Force acquisition post earlier this year. "The need for change is accentuated by the budget environment we live under today.

"The expeditionary aerospace force and our core competencies are the launch pad for our transitioning approach," he said. "The Air Force Board of Directors has put a lot of effort into articulating our mission and vision. Responsible stewardship is a key contribution across all core competencies. Now we must focus on the efforts needed to extend our position as the world's dominant aerospace power."

Delaney said successful transition would depend on three things: pioneering program management; acquisition reform; and a viable, focused science and technology [S&T] program.

"By pioneering program management, I mean that I will look to our program managers to be prudent risktakers, aggressive in implementing acquisition reform," he said. "AQ has been at the forefront of acquisition reform, setting the pace via the *Lightning Bolts* initiatives. We will continue to accelerate the trend to more business-like processes."

The *Lightning Bolts* represent a "jump-start" to implementing acquisition reform throughout the Air Force, with emphasis on streamlining organizations, developing relevant acquisition strategies, and encouraging the use of teaming as an acquisition workforce multiplier.

Delaney said the Air Force's current science and technology program was a "hot topic" during his confirmation process.

"Today's tight-budget environment forced the Air Force to make tough decisions," he noted. "While we recognize and appreciate the impact of S&T on current warfighting capability, we must make the S&T investment today to ensure tomorrow's dominance. We must also look for innovative ways to demonstrate the value of today's S&T investments.

"We have some critical partners to assist us in attacking these challenges," he said. These partners include the warfighters, whom "we must work closely with ... to nail down requirements early on and remain focused on keeping the product affordable. Recent successes such as the evolved expendable launch vehicle program clearly illustrate the tremendous benefits of partnering with industry.

"And finally, we must be open and honest with Congress, keeping them informed on program matters," Delaney said.

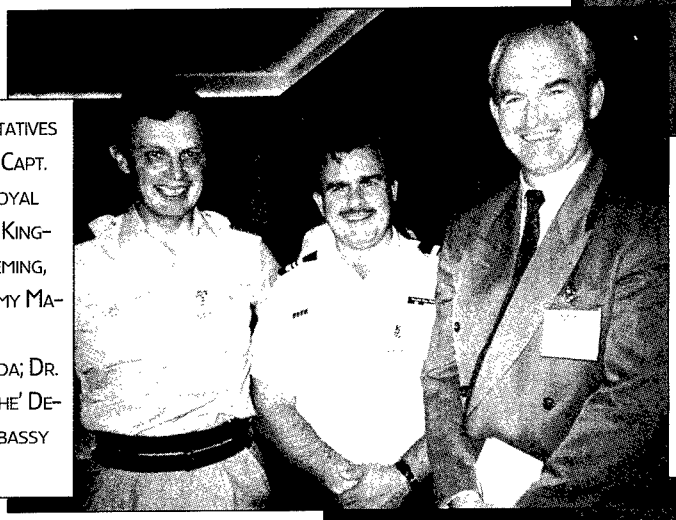
Editor's Note: This information is in the public domain at **http://www.af.mil/news**.

Testing and Training: A National Partnership — 2nd Annual Symposium and Exhibition

"We're Testing Weapons Systems And Conducting Training the Way The 21st Century Warfighter Fights"

NORENE L. BLANCH

"IMPERATIVES FOR READINESS" — NAVY VICE ADM. PATRICIA TRACEY, DEPUTY ASSISTANT SECRETARY OF DEFENSE FOR MILITARY PERSONNEL POLICY.



FOREIGN REPRESENTATIVES FROM LEFT: GROUP CAPT. CHRIS LAMPARD, ROYAL AIR FORCE, UNITED KINGDOM; MAJ. BILL FLEMING, STAFF OFFICER, ARMY MATERIEL COMMAND, EMBASSY OF CANADA; DR. JOHN RILEY, ATTACHE' DEFENCE SCIENCE, EMBASSY OF AUSTRALIA.

Budget reductions, significant decreases in the workforce, and program cancellations are an all too familiar reality throughout the federal government, and the Department of Defense (DoD) has been impacted for more than a decade like no other agency. This has caused DoD to make reforms in acquisition policy and come up with creative alternatives for ensuring military readiness in an ever-changing political environment where the warfighter must be ready to deploy at a moment's notice.

Opening Day

With the warfighter as the focal point, defense-related testing and training communities, government agencies, private industry, and academia came together for the 2nd Annual Testing and Training Symposium and Exhibition, held Aug. 17-19, in Orlando, Fla., to form what conference organizers refer to as a "21st Century Partnership." In addition, a diverse group of exhibitors from industry, government agencies, and the Army, Navy, Air Force, and Marines showcased their wares during the three-day Exhibition.

The conference highlighted how these communities reached their objective of conducting cost-effective testing and training through improved cooperation and coordination. Moreover, it provided participants with an opportunity to develop more effective communications and understanding on issues impacting the readiness, effectiveness, and survivability of our nation's combat forces.

CHAIRMAN'S TABLE, SEATED FROM LEFT: JAMES F. O'BRYON, DIRECTOR, LIVE FIRE TEST AND EVALUATION, OSD; NAVYREAR ADM. TIMOTHY BEARD, COMMANDING OFFICER, NAVAL STRIKE AND AIR WARFARE CENTER; RETIRED ARMY BRIG. GEN. SAMUEL COCKERHAM; NAVY CAPT. LADSON WEBB, DIRECTOR, AVIATION PROGRAMS, PROGRAM EXECUTIVE OFFICE (AIRCRAFT CARRIERS).

Second in a series, this year's Symposium and Exhibition was sponsored by several agencies: the National Defense Industrial Association (NDIA), Test and Evaluation Division, in cooperation with the Office of the Secretary of Defense (OSD); the Naval Air Warfare Center

***Blanch** is an Editor, Visual Arts and Press Department, Division of College Administration and Services, DSMC.*

Photos by Jay Gould

Training Systems Division (NAWCTSD); the U.S. Army Simulation, Training and Instrumentation Command (STRICOM); the Marine Corps Programs Office; Air Force Agency for Modeling and Simulation (AFAMS); and the National Training Systems Association (NTSA).

C. Samuel Campagna, Director, Operations, NDIA, welcomed the audience and introduced the symposium chairman and moderator of the event, James F. O'Bryon, Deputy Director of Operational Test and Evaluation/Live Fire Testing, Office of the Secretary of Defense. O'Bryon also serves as chairman of the Test and Evaluation Division of NDIA.

Briefing the conference agenda on opening day, O'Bryon told the audience that input from last year's event was crucial for development of this year's agenda. "Responses from last year's conference questionnaires expressed the strong desire to have this symposium focus on the needs of the warfighter," said O'Bryon. As a result, he focused his keynote remarks and addressed the audience from that perspective.

Florida Leadership, from left: Army Brig. Gen. Jimmy Watson, Assistant Adjutant General, Army State of Florida; Congressman John L. Mica (R-Fla.).

Tester and Trainer, from left: Dr. Ernest Seglie, Science Advisor to Director, Operational Test and Evaluation, OSD; John Walsh, Assistant Director, Collective Training, Office of the Under Secretary of Defense for Readiness.

Partnering Step 1, "Learning to Communicate," seated from left:: Navy Rear Adm. Timothy Beard, Commanding Officer, Naval Strike and Air Warfare Center; John Daly, Amon Carter Professor of Communications, Distinguished Teaching Professor, Professor of Management, University of Texas at Austin; O'Bryon.

Keynote speakers included United States Congressman John Mica (R-Fla.); Terry Finger, Staff Assistant, Military Affairs, Office of Congressman Bill McCollum (R-Fla.), reading a statement from the congressman; Army Brig. Gen. Jimmy Watson, Assistant Adjutant General, Florida National Guard, representing the Governor of Florida; and Dr. Ernest Seglie, Science Advisor to the Director, Operational Test and Evaluation, Office of the Secretary of Defense.

Congressional Viewpoint

United States Representative John L. Mica (R-Fla.) reflected on national history when he stated, "Under our nation's constitution, our number one responsibility, our whole purpose for coming together as a nation is military security and the common defense of this nation.

"We have to do that today in a cost-effective manner," said Mica, "and we're in a new world in terms of world order as we get called upon, whether we like it or not, to be some of the police forces of the world – and that all has a price tag too."

Mica reflected on the national defense and how we spend money. Noting that in 1955, 63 percent of the federal budget went toward national defense, he contrasted those numbers with today's reduced defense budget. "In 1999, right now, that's down to 16 percent. We have a much smaller share in defense and in our number one national priority."

Although the defense budget has drastically decreased, the demand on the military to perform has dramatically increased. Warfighters have been forced to transition from their role as our nation's defenders to their current role as peacekeepers serving as part of multinational forces spread out over numerous "hot spots" throughout the world.

In the wake of these demands, the Services are still expected to stay current with advanced technology and maintain an experienced military force that is well trained to effectively use the new technology.

Training and Readiness

Mica considers training of the warfighter to be *important* and *vital*. The whole di-

mension of the training of our military forces is dramatically changing," he explained. Referring to force composition, Mica noted that the nation's forces are no longer just made up of active-duty personnel, but also of reserve personnel who need to be called into active duty at short notice. "We need readiness capability, and that's why training and education is so important."

Simulators and simulations are cost-effective supplements to live exercises for ensuring the readiness of military personnel despite budget and manpower constraints. "When you have such an important responsibility as national defense, and when you have a limited commodity –which is taxpayer dollars –you want to see that [the money] is spent in an appropriate and cost-effective manner, and nothing is more cost-effective in my opinion than simulation. Nothing has a better future in my opinion than simulation," says Mica.

Advanced Distributed Learning

Another important initiative Mica supports to enhance readiness is Advanced Distributed Learning (ADL). Mica described ADL as a program providing "real-time training over the Internet so that soldiers and sailors can access training information and data when and where they need it by simply logging onto the computer. This initiative will use technology to eventually replace paper-based education and training supplements, and again, we have to look at cost-effective approaches."

These Projects Offer Real Training Opportunities to the Warfighter

Mica spoke about his involvement and success over the past three years in supporting the Live Fire Testing and Training initiative in Congress.

Simulation is one area that has been enhanced with these funds. Education of the warfighter in particular will get a boost through such projects as the Small Arms Trainer and the Combat Trauma Patient Simulator (Human Patient Simulator).

Small Arms Trainer. The Use of Modeling and Simulation to Support Small Arms Testing, Lethality, and Vulnerability Issues (MSSAT) project provides a reconfigurable engineering tool to the small arms community. MSSAT is using modeling and simulation techniques for design, evaluation, modifications, and testing of new weapon concepts. This project has made use of the Small Arms Simulator Testbed (SAST) to provide a validated synthetic environment from which real-time high-fidelity performance data can be collected and analyzed. This data will allow the user to address trade-off analyses, performance predictions, and lethality issues related to the development and testing of small arms weapons systems. MSSAT uniquely addresses the needs of both the live fire testing community and the small arms training community by directly supporting conceptual design, developmental testing, operational testing, and small arms training.

Human Patient Simulator. The Human Patient Simulator uses technology to take training for medical treatment on the battlefield to a new level. This initiative combines the efforts of the military and private sector in the development of a training tool that will teach medical personnel to properly assess and treat medical emergencies that would could be expected in combat or national emergencies.

Main Agenda

According to O'Bryon, the Human Patient Simulator, is a particularly exciting program, not only because it began as a Live Fire Testing and Training project, but also because it has already saved more money than we have invested into it. "We have now brought that through the incubator, and now it is on its own and is doing extremely well."

Let's Talk

The Human Patient Simulator is just one of many successes the testing and training community could talk about. "Things are changing," said O'Bryon. He stressed the importance of the testers and trainers coming together as partners to discuss ways in which they can most effectively and economically prepare the warfighter for their mission in the face of these changes.

Taking the Issues to the Source

What better way to help testers and trainers work together more effectively than to go to the source – the testers and trainers themselves. And the conference organizers did just that by offering two break-out sessions that asked testers and trainers participating in the conference two important questions. What can we, the testers, do for the trainers? What can we, the trainers do for the testers?

Q

How can we the testers, help the trainers?

A

The tester group facilitated by John Walsh, Assistant Director, Collective Training, Office of the Under Secretary of Defense (Readiness), determined that interaction between testers and trainers could be improved by involving testers in training events. These testers should be trained before testing begins and feedback used. The group also expressed that interaction between testers and trainers would be improved by getting equipment to the units sooner.

In addition, testers also wanted to see improvements in the area of data reuse, and cited examples of Advanced Warfighting Experiments, and Aegis. They also identified developmental testing, operational testing, training exercises, and educational institutions as prominent sources offering data gathering opportunities.

The group also suggested that stimulators for testing and training (T&T) usage be exploited and incentive funds be established for T&T projects.

Q

How can we, the trainers help the testers?

A

The trainer group facilitated byDr. Paul Deitz, Technical Director, U.S. Army Materiel Systems Analysis Activity, facilitated the session. Discussing the unique perspective of the trainer's position, the

group noted that they fall in between the systems engineer and the warfighter. This gives them the ability to evaluate and critique the "heart of the envelope."

Moreover, they believed that improvements in the following areas would be helpful to the testers.

- Better crossover between training and testing personnel, parallel integration at the technical/teacher level and test/training command level.
- Piggy-back tests on training evolution.
- Opportunities for distributed collaboration among unique facilities and in solving problems associated with federal release of spectral bandwidth.

Additional areas needing improvement include the development of common architecture for the instrumentation of testing and training; separation of the essence from the implementation for runtime, reconstruction, and differing needs; validation by the "Warfighter-in-the-Loop;" and improvements in digital data collection (embedded meta-data for ex-post facto reconstruction and multiple end users).

Industry Perspective

The conference audience also heard the views of industry presented by corporate leaders from the Economic Development Council of Mid-Florida, Northrop Grumman, Logicon Corporation, Science Applications International Corporation (SAIC), and the University of Central Florida.

Allied Nations

Various allied nations are making progress in implementing cooperation between testing and training communities. The conference audience heard from Australia, Canada, and the United Kingdom on their efforts and opportunities for partnering with these nations.

Resounding Themes – Small Steps Toward Implementation

After the presentations, briefings, and brainstorming, the task of getting these collaborated suggestions from paper to implementation becomes the real challenge. The answer may be found by looking at the recurring themes that surfaced throughout the conference.

The most prominent themes among the keynote speakers, panelists, and participants included the need for earlier involvement of testers in the development of weapons systems; earlier introduction of simulation into the process; increased collaboration to improve data collection procedures so that testers and trainers can both benefit from documented lessons learned; bringing realistic scenarios to both testing and training; and more concentration on finding ways to leverage technology and research capabilities among government facilities, industry, and academia.

With each theme, every suggestion, and the countless discussions emerging from the conference, ultimately comes the framework for the successful formulation of a "21st Century Partnership." And with this partnership lies the potential for testers and trainers to take one small step toward implementation of these ideas, along the path that leads these two communities to fulfilling their most important priority of all – to test weapons systems and conduct training *the way the 21st century warfighter fights.*

Government-wide Acquisition Management Intern Program

Deidre Lee, Administrator, Office of Federal Procurement Policy, announced the launching of the Government-wide Acquisition Management Intern Program in October 1999. Sponsored by the U.S. Department of the Interior (DOI), the first class of interns is scheduled to arrive in June 2000. "I appreciate the efforts of the Procurement Executive Council's Acquisition Workforce Subcommittee in pulling this together," said Lee. "Certainly, we want to take advantage of this opportunity. I look forward to wide participation by departments and agencies as we launch the first class of the Government-wide Acquisition Management Intern Program."

A generic Memorandum of Understanding that expresses the terms of the program; a generic Reimbursable Support Agreement that exchanges funds; a program description; and an itemized projected budget can be downloaded from the ARNet Web site at **http://www.arnet.gov/Updates/gwamip.html.**

For further information on the program, contact:

Kay Mathews	**DOI**	**(202) 208-2757**
Dolores Chacon	**DOI University**	**(202) 208-5616**

Photo Courtesy NASA

Historical Realities of C-17 Program Pose Challenge for Future Acquisitions

Learning From the Past Before Initiating Major Aircraft Buys

BETTY RAAB KENNEDY

This article advocates incorporating more historical realities into the management and execution decisions of aircraft acquisition programs. Ideally, acquisition improvements should encompass the corporate whole: the Congress, DoD, the Air Force, and the contractor. A formidable task, so reformers take heart.

Not discounting the many good acquisition initiatives, more study and debate about acquisition processes and procedures is needed in light of the C-17's tumultuous history. In concluding this article, I offer future acquisition students, action officers, program managers, and decision makers five maxims that evolved from my study of the C-17 program. If others differ, the acquisition community will reap the benefits of the exchange in viewpoints.

Not a Straightforward Process

The acquisition of the Air Force's newest military transport, the C-17 Globemaster III, was not a straightforward process. The C-17 program encountered political opposition and limited funding, plus technical development and program management difficulties, which affected the program's cost, production, and delivery schedule. From the beginning, no consensus existed within DoD or the Air Force on what type of airlift aircraft was

Photo courtesy The Boeing Company

THE C-17 AS A HIGH-WING, FOUR-ENGINE, T-TAILED AIRCRAFT WITH A REAR LOADING RAMP. IT IS 174 FEET LONG AND 55.08 FEET HIGH, WITH A WINGSPAN OF 169.75 FEET. MAXIMUM TAKEOFF GROSS WEIGHT AT PROGRAM START-UP (AUGUST 1981) WAS 570,000 LBS. MAXIMUM PAYLOAD WAS 172,200 LBS. WITH A PAYLOAD OF 160,000 POUNDS, THE C-17 CAN TAKE OFF FROM A 7,600-FOOT AIRFIELD, FLY 2,400 NAUTICAL MILES, AND LAND ON A SMALL, AUSTERE AIRFIELD IN 3,000 FEET OR LESS. THE C-17 CAN BE REFUELED IN FLIGHT.

***Kennedy** is a Staff Historian, Headquarters, Air Mobility Command. She has followed the acquisition of the C-17 for over 13 years and has twice received the Air Force History and Museums Program Excellence in Historical Publications Award.*

The U.S. military needed the ability to project a rapid deployment force anywhere in the world, and responsive, global-reaching airlift became an essential element of that strategy.

AFTER MORE THAN 15 YEARS IN STORAGE IN THE ARIZONA DESERT, THE MCDONNELL DOUGLAS YC-15 WAS BROUGHT OUT OF MOTHBALLS TO CONTINUE ITS MISSION AS AN ADVANCED TECHNOLOGY DEMONSTRATOR. IT WAS THE FIRST AIR FORCE DEVELOPMENTAL AIRCRAFT LEASED BACK TO A CONTRACTOR UNDER A COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENT. THE PRIMARY REASON FOR THE AGREEMENT WAS TO PROVIDE A PROTOTYPE TO EXPLORE NEW TECHNOLOGY APPLICATIONS FOR THE C-17 AND OTHER AIRLIFT AIRCRAFT.

needed. In addition, how much airlift was required for war plans was largely undefined. Securing necessary funding for the C-17 was simply an ordeal. That the program's funding fell victim to the budget axes wielded by Congress, DoD, and Air Force undermined the ultimate goal – timely operational delivery of the C-17.

The C-17's birthing also took place amidst heated competition and the excesses of political influence. Individual personalities also affected the program's direction through four presidential administrations. One other macro ingredient to the program's history was the performance of the manufacturer and the many subcontractors.

Despite these difficulties, the C-17 entered operational service with the Air Mobility Command June 14, 1993, and in the intervening years, proved its worth as a very reliable and capable airlift aircraft.

Historical Realities

When Secretary of Defense Harold Brown made the decision to pursue a new strategic transport in November 1979, President Jimmy Carter's emphasis on reducing military expenditures had just brought about the end of the Advanced Medium Short-Takeoff-and-Landing Transport (AMST). Besides concerns over costs, developing the AMST engendered little support as it only offered tactical airlift capabilities. As a result, the C-X (Cargo Transport Aircraft-Experimental) – the future C-17 – evolved from discussions between Office of the Secretary of Defense (OSD) and Air Staff officials on expanding the role of the AMST to include strategic capabilities.

From the beginning, the intent was for the C-X to perform both strategic and tactical missions, but OSD and Air Force put the tactical, or intratheater missions in a secondary role. The national security strategy required more long-range airlift. Events in the Persian Gulf as well as the 1979 Soviet invasion of Afghanistan, underscored the need for the Carter Administration to look beyond the preoccupation with planning for a European-based NATO-Warsaw Pact conflict that relied heavily on prepositioned materiel and equipment. The U.S. military now needed the ability to project a rapid deployment force (RDF) anywhere in the world, and responsive, global-reaching airlift became an essential element of that strategy.

Defining, Agreeing, Selecting

The Air Force, joined by the Army and Marine Corps, formed a C-X Task Force in November 1979 to define requirements for a new type of transport. Led by Air Force Maj. Gen. Emil Block, the task force recommended development of an air refuelable aircraft with an outsize capability that could deliver large payloads over intercontinental distances into either main airfields or small, austere airfields. The joint task force reasoned that the ability to fly into small, austere airfields improved force deployment and employment, enhanced the flow of aircraft by decreasing ground lines of communication, and closed the combat force or cargo on time, at the right place. Such a capability also meant less competition for space in theater and made interdiction by the enemy more difficult. The C-X Preliminary System Operational Concept (PSOC) called for

FIGURE 1. **C-17 Preliminary System Operational Concept**

Cargo Load	130,000 lbs. (2.25Gs)
Runway	3,000 ft.
Range Unrefueled	2,400 miles
Backing Up	1.5-% grade w/130,000 lbs.
Turning	180° turn on 90-ft. runway
Airdrop	Yes
Service Life	30,000 hrs.
Utilization Rate Peace-/Wartime	2.5-3.5/12.5 hrs.

the development of schedules for a total aircraft buy of 150 and 200 aircraft (Figure 1).

Deputy Secretary of Defense W. Graham Claytor Jr., approved the C-X Mission Element Need Statement (MENS) in November 1980, formally documenting the requirement and granting the Air Force authority to identify and evaluate potential solutions. Claytor, however, stipulated that the Secretary of Defense would have final approval over the choice of a new C-X aircraft or a derivative of an existing transport (including commercial) or a mix thereof. Another OSD change made the requirement for small, austere airfield capability dependent on whether penalties would apply for executing the primary mission – strategic airlift. Still another OSD change deleted recognition of the studies documenting the intratheater airlift shortfall from the MENS.

That the requirement for small, austere airfield operations remained, albeit in a secondary role, was due in part to the advocacy of the commander of the Military Airlift Command, Air Force Gen. Robert Huyser, who wrote directly to Secretary of the Air Force Hans Mark asking for his support. In October 1980, the Air Force Systems Command released the final request for proposal to industry. As written, the proposal contained an ambitious initial operational capability (IOC) date of 16 operational aircraft by FY87.

In succeeding years, competing interests, sparse funding, and program management and developmental problems forced the program into an "on again, off again" mode, affecting unit costs, production, delivery, and the IOC date. One major delay was the need to await the results of a new requirements review, the Congressionally Mandated Mobility Study (CMMS), as its recommendations would provide the basis for determining the U.S. force structure required for contingencies. Issued in May 1981, CMMS recommended a fiscally constrained goal of 66 million ton-miles per day (MTM/D) in strategic airlift capability. The projected FY86 baseline capability was only 46 MTM/D, and Congress stipulated half of the additional 20 MTM/D would be in outsize cargo capability.

The CMMS was based upon the analysis of four scenarios: a regional conflict in the Persian Gulf; a Soviet invasion of Iran; a NATO-Warsaw Pact conflict; and/or a contingency in the Persian Gulf, with a precautionary reinforcement of Europe. The study did not address tactical airlift requirements. With the CMMS also disclosing a requirement to improve sealift capability, competition for DoD mobility dollars existed. Congressional support for the new program was far from assured. Representative Richard Ichord (D-Mo.), Chairman of the House Research and Development Subcommittee, which recommended denying the C-X funding request of $81.3 million for FY81, laid out the subcommittee's position in a letter to Defense Secretary Brown. "The C-X – a future system – simply could not be supported in the absence of funds for the procurement of sealift assets that are needed to satisfy our near and intermediate requirements. Beyond the matter of priorities, the case for the C-X per se has not been made to our satisfaction."

In the end, Congress appropriated $35 million for the C-X program in FY81 and required the new Reagan Administration's Secretary of Defense, Caspar Weinberger, to certify the program met congressionally stipulated requirements before funds could be obligated.

Meanwhile, the Air Force Systems Command/Aeronautical Systems Division conducted a source selection competition. Boeing, McDonnell Douglas, and Lockheed all submitted proposals. In August 1981, the Air Force announced McDonnell Douglas' C-17 as the winning design. The C-17 was a larger, heavier version of McDonnell Douglas' AMST YC-15. McDonnell Douglas offered an aircraft capable of a maximum gross take-off weight of 570,000 pounds and a design payload of 172,200 pounds (at 2.25Gs) for 2,400 miles. It would land on a small, austere airfield of less than 3,000 feet with its design payload. The C-17 would accommodate 102 paratroopers and up to 40 A-22 containers for airdrop missions, with a total airdrop payload of 110,000 pounds.

Alternatives, Debate, Delays

The second year of funding for the C-17 was even worse. Congress denied Research and Development C-X funding for FY82; instead, it provided $50 million in procurement funds for wide-bodied aircraft, and another $15 million for studies on airlift enhancement and C-X alternatives. Within weeks of the source selection decision, Lockheed submitted an unsolicited proposal to provide 50 C-5Ns (later designated C-5Bs). As feared by the Air Staff, Lockheed's offer and subsequent visits by Lockheed and Boeing officials with Dr. Richard DeLauer, Deputy Secretary of Defense for Research and Engineering, caused uncertainty for several months. DeLauer was a key figure in providing Congress the requested certification and DoD endorsement, and he was not satisfied the C-17 was the right decision, considering the available options. For months, DeLauer held up

the certification, asking the Air Staff to analyze and re-analyze the C-5N and the C-17. In an Oct. 30, 1981, meeting with Air Staff representatives, DeLauer recommended purchasing C-5Ns and KC-10s. Thus, while the Air Force had decided on the C-X and McDonnell Douglas as the contractor for the program, DoD apparently disagreed.

The Congressionally Mandated Mobility Study was based upon the analysis of four scenarios: a regional conflict in the Persian Gulf; a Soviet invasion of Iran; a NATO-Warsaw Pact conflict; and/or a contingency in the Persian Gulf, with a precautionary reinforcement of Europe.

This was confirmed in December 1981, as Secretary Weinberger closed his certification to Congress with a cautionary note stating, "The Department has not yet reached a final decision on which of the various alternative aircraft programs to pursue." Later that month, Deputy Secretary of Defense Frank Carlucci directed the Air Force to prepare a system analysis study of the C-17 and alternative proposals, ranking each candidate (Figure 2). Air Force analysis endorsed the C-17 and an expanded Civil Reserve Air Fleet (CRAF) enhancement program.

Finally, at the end of January 1982, Carlucci decided in favor of the C-5N, and Secretary Weinberger agreed. Shortly thereafter, Secretary of the Air Force Verne Orr announced a near-term airlift enhancement program of 44 KC-10 tanker/cargo and 50 C-5B aircraft. Orr explained that the C-5B could be operational three years sooner than the C-17, providing an immediate 3.8 MTM/D capability. He was willing to buy existing, less-advanced systems, believing the need to address the airlift shortfall warranted such measures. Orr was also mindful that Congress had eliminated Research, Development, Test and Evaluation funds for FY82 but would provide funding for a near-term program. The new Reagan Administration was also willing to spend money on addressing the airlift shortfall. Orr indicated in his memorandum to Army Gen. David Jones, Chairman of the Joint Chiefs, that he was no longer fully committing the Air Force to the long-term solution.

Following the controversial announcement, Boeing submitted another unsolicited proposal, offering 50 747s. Boeing considered the re-winged C-5s capable of handling the outsize CMMS requirements, so the proposed procurement of C-5Bs and KC-10s would meet any deficiencies in bulk and oversize cargo, the same role 50 747 freighters could fulfill. From March until midsummer 1982, DoD, Air Force, and Lockheed lobbied hard to prevent Congress from overturning the near-term solution. So hard in fact, that the General Accounting Office disclosed, and Congress took action on, allegations of collusion between the government and Lockheed.

Replying to Boeing in May, Carlucci stated that commercial freighters "... more appropriately belong in the CRAF Program rather than the Air Force organic airlift force." A Presidential letter from Ronald Reagan to key members of Congress in July 1982 reiterated these views, effectively ending Boeing's run at the near-term airlift solution. Modest funding by Congress in FY83 and FY84 – $60 and $27.6 million, respectively – kept the long-term solution of the C-17 alive, but resulted in a slippage of the IOC date to the 1st Qtr., FY92.

Two documents in this period substantiated the requirement and solidified support for the C-17. In September 1983, the Air Force published the *US Air Force Airlift Master Plan*, which outlined the Air Force's commitment to modernizing its military airlift force structure and fulfilling the CMMS' 66 MTM/D goal. The master plan regarded the C-17 as an inter- and intratheater airlifter with a direct delivery role. Further, the Air Force announced a requirement for 210 C-17s (total aircraft inventory) destined to replace the aging C-130 and C-141 systems in the late 1990s.

In February 1984, Secretary Weinberger, with the unanimous endorsement of the Joint Chiefs of Staff, forwarded the *Validation of the Requirements Concept and Design for the C-17* as required to Congress. This report provided another ex-

FIGURE 2. **1981 Air Force Ranking of Airlift Candidates**

Aircraft	Program Risks	Outsize Cargo	MHE	Ground Maneuverability	Intratheater	Maintainability	Manpower	Military Utility
C-17	4	2	1*	1	1	1	1	1
C-5N	3	1	2	2	2	4	4	2
B-747	2	3	4	4	4	3	3	4
KC-10	1	4	3	3	3	2	2	3

*1 equals excellent.

tensive review and substantiated the number of C-17s. The Services were fully behind the C-17.

While the master plan and validation report displayed consensus, program completion was far from guaranteed. Lockheed challenged the C-17 in February 1984 with yet another unsolicited proposal, which sought to complete testing of the C-5's direct delivery capabilities into austere airfields. (Testing was suspended in 1970 because of problems with the C-5's wings.) Lockheed's proposal sparked intense congressional and media debate over performance characteristics and costs of the two weapon systems for several years.

In February 1985, the program was reaching a major milestone decision – full-scale engineering development (FSED); at the same time, congressional and Air Force Program Objective Memorandum reductions for FY86 slipped the IOC date to the end of 1992. These funding reductions also delayed 14 of the first 36 aircraft and impacted technical data, support equipment, and training. At this point, the C-17's production costs had increased from $33.7 billion to $35.1 billion, primarily because of inflation and limited funding.

More limited funding with more restrictive language followed the next year. Yet, a measure of hope appeared in May 1987 as Congress overwhelmingly defeated Representative George Darden's (D-Ga.) amendment to delete all funding for the C-17 program. At the OSD level, Weinberger concurred with Secretary of the Air Force Edward Aldridge's designation of the C-17 program as a Defense Enterprise Program that, among other things, indicated their commitment to the program's success and funding priority. Despite this designation, the OSD staff had concerns. Originally Robert Costello, Under Secretary of Defense for Acquisition, had advised Weinberger against including the C-17, citing "high technical risks."

Maxim No. 1

Weapon system programs cannot succeed without consensus and astute, visionary leaders.

By this time, avionics development and integration had fallen considerably behind schedule. The C-17 was McDonnell Douglas' first effort at developing and integrating complex avionics systems, and the corporation's decision to modify the Sperry hybrid fly-by-wire and hydro-mechanical flight control system to a primary quad-redundant digital flight control system with a hydro-mechanical back-up only complicated the matter. Additionally, concerns emerged over increases in the aircraft's weight growth and cost estimate increases for logistics resources and military construction.

Inevitably, the years of delays and funding difficulties had adversely impacted the contractor's ability to perform. By the mid-1980s, McDonnell Douglas no longer had the C-17 workforce that it had started with, forcing the corporation to rebuild its base of expertise. In November 1987, when the first part for the first C-17 was manufactured, six years had lapsed since source selection. Nearly a year later, in August 1988, assembly of the first C-17 components began, and another two years passed before the first C-17 was completed and ready for preflight testing in December 1990. Clearly, this was no way to build an airplane, especially one critical to national defense.

Crisis Looms

In 1989, the pattern of funding cuts with corresponding adjustments to procurement profiles continued. President George Bush's decision to trim the FY90 budget, proposed by his predecessor, stretched out the C-17 program just as the Defense Acquisition Board (DAB) approved start-up of low-rate initial production. The new Secretary of Defense, Richard Cheney, supported the program more than Air Force leaders, who were prepared to accept large cuts.

By April 1989, McDonnell Douglas acknowledged the C-17 program was over-budget by $400-500 million. Cost overruns of $150 million were attributed to problems developing the mission computer and the electronic flight control system. Both systems had sizeable software requirements to grapple with.

In August 1989, McDonnell Douglas initiated a C-17 recovery plan, but the corporation's less than successful implementation of quality management principles hampered these efforts. Citing delays in the integration of the electronic flight control system and the mission computer software, and the reorganization of McDonnell Douglas, Congress cut funding for FY90. As an aftereffect, IOC slipped to June 1993. Consequently, the Air Force advised the first flight probably would not occur until June 1991. The November 1989 Defense Acquisition Decision Memorandum attempted to reorder the program; however, succeeding events would disrupt the C-17 procurement profile, which sought to retain multi-year unit cost savings.

In April 1990, Cheney held a Major Aircraft Review (MAR) of the Navy's A-12 and the Air Force's B-2, C-17, and Ad-

vanced Tactical Fighter. The MAR reduced the number of C-17s from 210 to 120. Accordingly, the production peaks were adjusted to 24 aircraft vs. 29. The plan now called for C-17s to replace only the retiring strategic C-141s and on a one-for-one basis.

A major influence on Cheney's decision was the subsiding Cold War threat. At this time, the airlift mobility requirement was revised from a capability of 66 to 48 MTM/D. Decisions at the MAR resulted in a C-17 cost increase of 25 percent, $260 million per unit. The Air Force placed the total cost of the 120-aircraft program at $31.2 billion and anticipated an IOC of July 1994. As a result of the MAR, Congress cut C-17 funding for FY91. This, in turn, further revised the C-17 procurement profile, moving the first flight from August 1990 to June 1991, and the IOC date to August 1994. The Air Force cited McDonnell Douglas in May 1990 for various problems in managing the C-17 program, and in July of that year, the Air Force withheld progress payments.

C-17 program difficulties persisted. When Cheney abruptly canceled the Navy's A-12 program in January 1991, after learning somewhat "overnight" that the program was a billion dollars over budget, 8,000 pounds overweight, and 18 months behind schedule, the OSD immediately undertook a C-17 review.

Visits to McDonnell Douglas disclosed little oversight by top management, as well as the lack of an effective risk management program. Defense officials also criticized the corporation's manufacturing procedures, noting a lack of integration and coordination had resulted in redundant work and increased costs. Concluding the review process, Dr. David Chu, the Assistant Secretary of Defense for Program Analysis and Evaluation, believed the C-17 was still cost-effective and still the best option. Navy Rear Adm. Dave Robinson, who chaired the Joint Requirements Oversight Council, stated nothing had changed since the April 1990 MAR that would alter the need for the C-17. Donald Yockey, the Under Secretary of Defense for Acquisition, did not recommend terminating the C-17 at this juncture. Yet, while support from OSD and Joint Staff continued, the question remained, "How strong?" As one of the primary contractors on the A-12 program, McDonnell Douglas heeded the criticisms of the C-17 program, and more oversight continued in the following months.

Concerned about the C-17 program, Congress cut funding for aircraft purchases and enacted restrictive measures – downright "hold DoD's feet to the fire" – in the National Defense Authorization Act for FY92 and FY93. Congressional staffers made it perfectly clear to Air Force liaison officers, that while no one disputed the mobility requirement, McDonnell Douglas simply needed to get the program in order over the next year or else face the consequences. Staffers also made a point of remarking that, "It would have been easier for us to fight the fight [for the C-17] if your Chief [Gen. Merrill McPeak] and Secretary [Donald Rice] had been more vocal." Despite the program's woes, the C-17 showed promise with its successful first flight on Sept. 15, 1991.

In 1992, the C-17 program needed to accommodate a further revision of national security mobility requirements, in light of the post-Cold War environment. After two years, the Mobility Requirements Study was completed, favorably documenting a requirement for 120 C-17s and establishing a new goal of 57 MTM/D in strategic airlift capability. The most demanding scenario required the delivery of nearly five Army divisions to the Persian Gulf area, assuming "moderate" risk.

That June, Rice personally communicated to John McDonnell the need to demonstrate sustained improvements in the C-17's production performance. The Air Force knew the program could no longer continue in its current state; obviously, it required extraordinary management effort. The Air Force also realized that it had to ensure congressional funding of adequate production rates before McDonnell Douglas could improve the status quo. Regrettably, the Air Force was not successful in this effort.

Maxim No. 2

Expect and prepare for world order/national security changes.

Pointing to delays in the delivery and test schedules, Congress cut funds. The reductions added three more years to the production run, increased program costs by approximately $210 million, and threatened the IOC date. Additionally, Congress restricted the obligation of funds until the Secretary of Defense submitted another extensive certification report. Adding to program concerns, the wings of a static display C-17 buckled in October 1992 when stress testing reached 128 percent, requiring a retest in 1993 to achieve the designed 150 percent. Not all was grim, for by year's end, the C-17 owned several world records. The plane did fly!

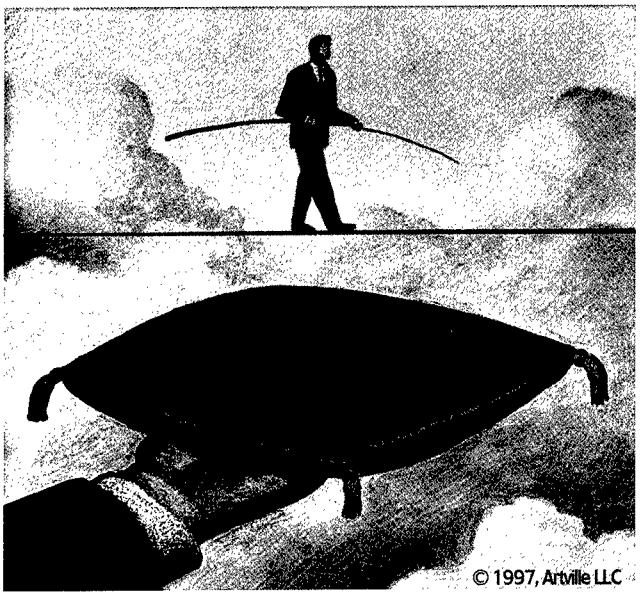
Probation

On several fronts, 1993 was a watershed year for the C-17 program. Right off, in

President Bill Clinton's Budget submission for FY94, the C-17 program acknowledged an IOC slip from September 1994 to January 1995. Early in 1993, Air Force Gen. Ronald Fogleman, then the commander of Air Mobility Command, publicly expressed interest in alternatives to the C-17, if McDonnell Douglas' production problems continued. Fogleman considered the state of the program, as well as concerns voiced by OSD and Air Force, congressional pressure, and the new Clinton Administration with its emphasis on cutting costs. He regarded it as his responsibility to plan an alternative course, thus precluding the command from losing its funding for critically needed airlift modernization.

Maxim No. 3

What can be managed should be; otherwise, bear the consequences.



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Fogleman's statements renewed interest in previous options, namely the Boeing 747 and the Lockheed C-5D as Non-Developmental Airlift Aircraft (NDAA). Problems with wing cracks in the C-141 fleet also heightened the search for other options. The commercial derivative NDAA, however, did not set well with civil carriers in the CRAF program. The carriers and their associations regarded the commercial NDAA as a breach of the National Airlift Policy directive, signed by President Ronald Reagan in 1987, which recognized the importance and need for both civil and military airlift. Congressional support was forthcoming for all views – the business interests of the civil carriers as well as for the C-5D, C-17, and B-747. Heady debate ensued.

Continued controversy and uncertainty riddled the program. At the end of April 1993, Defense Secretary Les Aspin disciplined four senior Air Force officials for their handling of the program. This included improperly channeling $442 million to McDonnell Douglas when the company was having financial difficulties in late 1990. The following month, just as the first C-17 entered operational service, Under Secretary of Defense Dr. John Deutch advised John McDonnell, "Unless there is a strong resolve on the part of McDonnell Douglas corporate management to meet contract requirements, particularly schedule, specifications, and testing requirements, the C-17 program cannot be continued."

Deutch requested that McDonnell Douglas, the Air Force, and the Defense Plant Representative Onsite take corrective actions with regard to the operation of the program and its financial management.

Based on extensive reviews, Deutch announced in December 1993 that 40 C-17s would be built, but that DoD would halt the program if McDonnell Douglas did not improve it within two years. Ultimately, a November 1995 Defense Acquisition Board review would decide the program's fate.

Deutch's announcement contained several provisions. It continued the program for two years at a production rate of six aircraft per year and effectively placed the C-17 and McDonnell Douglas on "probation." It also presented a comprehensive settlement of all outstanding contract issues to McDonnell Douglas and launched a new study – Strategic Airlift Force Mix Analysis (SAFMA) – to determine the optimum strategy for a mixed force of C-17s and NDAAs. Congress was supportive, and the FY95 Defense Bill formally approved the claims settlement.

Turnaround

Despite the moratorium, the C-17 met another major program milestone with the declaration of IOC Jan. 17, 1995. To many, operational missions throughout 1994 and 1995, which took the C-17 around the world, indicated that despite problems with the program, the plane was very reliable and capable of living up to its strategic and tactical roles. However, meeting Army requirements for formation airdrops and dirt strip landings were especially long in resolution.

In addition to the C-17's operational performance, the results of another mobility requirements study and the SAFMA seemed to bode well for the pending DAB decision. In 1995, an Update of the 1992 Mobility Requirements Study, which incorporated the Clinton Administration's "Bottom Up Review" of national defense, validated to Congress a strategic airlift requirement between 49.4 – 51.8 MTM/D to support two nearly simultaneous major regional contingencies. This equated to a need for 120 – 140 C-17 equivalent aircraft. Since the C-5 was not the equivalent, but rather an alternative to the C-17, this study seemed to portend a favorable C-17 decision. A subsequent examination of the Mobility Requirements Study Bottom Up Review Update in 1996 revised the requirement to 49.7 MTM/D. (Fifteen years earlier, the CMMS had settled on a fiscally constrained airlift requirement of 66 MTM/D.)

As for the SAFMA, while a mix of 86 C-17s and 30 C-33s (a modified 747-400)

was the most cost-effective option in achieving the MTM/D goal, it did not provide for strategic brigade airdrop, intratheater airlift operations, or lesser regional contingencies that focused on peace enforcement. The SAFMA study concluded, "There is no existing substitute for the C-17 if that program is cancelled. There are no combinations of C-5Ds and/or C-33s that can provide the equivalent of 120 C-17s (or certainly not 140 C-17 equivalents)."

Convening at the end of 1995, the DAB, under the chairmanship of Dr. Paul Kaminski, Under Secretary of Defense for Acquisition and Technology, considered solutions to the strategic airlift MTM/D requirement. Before the board was the decision to purchase additional C-17s or combinations of C-17s and NDAA aircraft. Deputy Secretary of Defense John White announced Nov. 3, 1995, the DAB's decision to purchase a total of 120 C-17s.

Logic

The DAB regarded the C-17 as best providing the greatest amount of flexibility in meeting the strategic airlift requirements. Maximum [aircraft] on the Ground (MOG), along with austere and outsize capabilities were critical considerations. McDonnell Douglas' program improvement was another key consideration. Since the end of June 1994, all aircraft deliveries were ahead of schedule. Further, it did not make sense to procure the commercial NDAA (C-33), as 18 C-33s would deliver about a fifth of what the CRAF could at a comparable or slightly higher cost. Nor did the C-5 prove to be a cost-effective option.

The Nov. 3, 1995, Defense Acquisition Decision Memorandum directed the Air Force to develop and analyze a multiyear procurement alternative for the C-17 program. With congressional approval, the Air Force signed contracts with McDonnell Douglas Corporation and its subcontractors May 31, 1996, to buy 80 C-17s over seven years. These actions signified that the major acquisition hurdles of the C-17 had been successfully surmounted. America, at last, had a new transport well suited for the airlift tasks leading into the 21st century.

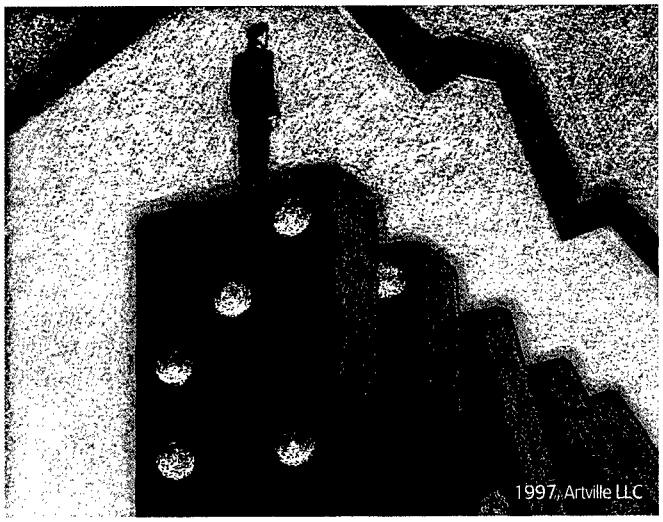
Five Maxims to Live By

Maxim No. 1: Weapon system programs cannot succeed without consensus and astute, visionary leaders.

Congress, DoD, Air Force, and the Services must come to a consensus and continually support a program or mutually decide to alter/terminate it. In the case of the C-17, the program and the contractor were essentially held in limbo year to year. Only on the brink of cancellation was a consensus reached. Such consensus could serve as the basis for future successful programs, but agreement is necessary at the inception of a program. Moreover, future programs require astute, visionary leadership—leadership that **determines** early on a program's stakeholders, support base, mission roles, and costs; that **expects** and **surmounts** delays, highs and lows in funding, requirement changes, intense lobbying, alternative proposals, cutting criticism, and extensive reviews; and that **fosters** professionalism, honesty, openness, and communication. What leaders certify or validate must be based upon integrity and soundness of judgement. The challenge is great.

Maxim No. 2: Expect and prepare for world order/national security changes.

It took nearly a decade-and-a-half to field the C-17 during four presidential administrations. Each administration had its own agenda. While the program experienced the lean years during the Carter Administration, Reagan's buildup of defense spending made the C-17 a long-term solution to the airlift shortfall.



The collapse of the Soviet Union ushered in a New World order, and the national security strategy shifted from thwarting a Soviet-led Warsaw Pact invasion of Europe to responding to regional conflicts around the globe. During Bush's and Clinton's tenures, strategic airlift mobility requirements went from attaining a wartime capability of 66 MTM/D, which justified 210 C-17s, to 49.7 MTM/D – roughly a 25-percent reduction. The United States also got involved in a major conflict in Southwest Asia. The Gulf War brought about a renewed appreciation of airlift's reach and rapid responsiveness. The C-17's direct delivery concept enabled it to adjust well to the new requirements, as proven in military operations in Bosnia and Kosovo. And during the C-17's gestation, the U.S. Air Force underwent the most extensive reorganization since its inception in 1947, resulting in strategic airlift giving way to the rapid global reach of airlifters and tankers working in tandem.

Maxim No. 4

Guard against negative cause and effect exchanges. Once born, they take on ugly, counterproductive lives of their own.

Will future weapon systems face similar circumstances? It is highly probable. Substantiating this view are examples of

the C-5 and C-141 transports. Both became operational during the Vietnam War and then endured lean flying years as a massive post-war drawdown and reorganization of resources and mobility requirements followed.

Maxim No. 3: What can be managed should be; otherwise, bear the consequences.

At first, congressional support was lacking, which stalled the program's progress. Nor was funding forthcoming. OSD and Air Force also differed on what was desired before and after source selection, making the program easy prey to its competitors and powerful legislators. Initially, mobility requirements for airlift had not been quantified. The escalation of costs exposed the program to cancellation and alternative aircraft. Reactive adversarial relationships developed when the contractor failed to perform as required, robbing the program of efficiencies and hampering positive solutions. Thus, bearing the consequences meant the C-17's IOC date changed at least seven times, resulting in a delay of some eight years.

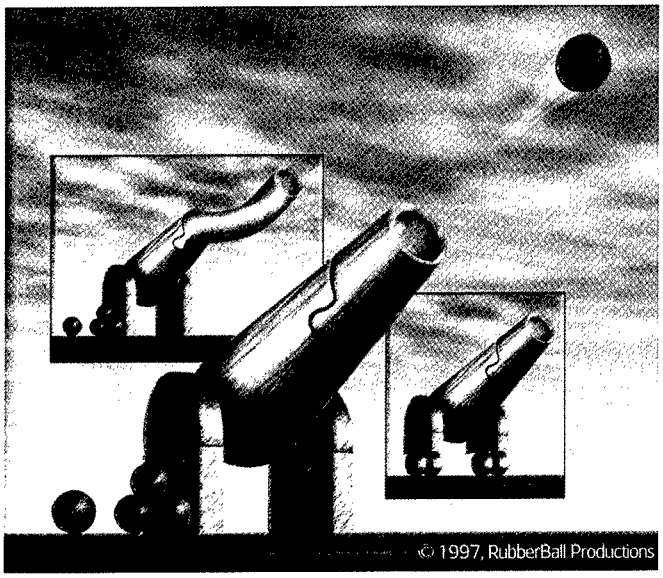
Maxim No. 4: Guard against negative cause and effect exchanges. Once initiated, they take on counterproductive lives of their own.

Acquisition programs can fall prey to a cause and effect merry-go-round. From the beginning, the C-17 program became trapped in such a cycle. Air Force and OSD indecision caused Congress to limit funding; as a result, limited funding caused the Air Force and OSD to propose a short-term (C-5B and KC-10) and a long-term (C-17) solution. The short-term solution delayed the long-term solution. Delay (and limited funding) laid the groundwork for contractor engineering and development problems, which caused ... Get the picture?

In order for the C-17 program to "get well," the vicious cycle needed to stop, which proved difficult, at best. In 1992, Air Force officials realized the program could no longer continue in its current state; Air Force desperately needed Congress to fund the program at adequate production rates. By this time, Congress' ingrained tendency was to cut funding. Yet, for McDonnell Douglas to improve, the program required adequate funding of production rates.

Maxim No. 5

Design weapon systems with the flexibility to grow and adapt.



Maxim No. 5: Design weapon systems with the flexibility to grow and adapt.

Although doctrine, tactics, and national strategy will always accommodate change faster than a weapon system, incorporating an eye toward change within the design of a weapon system is necessary. Doing so gives a little extra return on a huge investment that will stay in service for over 30 years. The C-141 and the C-5 illustrate this point.

In the decades since the introduction of these aircraft, their mission requirements have evolved. Special operations low-level requirements, fuselage stretching, and air refueling modifications to the C-141 are examples. Already, C-17 designers had no choice but to adjust to the weight growth of the Army's combat-configured tank and the changeover from Jeeps to High Mobility Multipurpose Wheeled Vehicles. And the C-17 has added airlift defensive systems for a more forward, threat-filled role. The changeover from single-row to dual-row airdrop within its first years of operations also speaks to the need for the flexibility to grow and adapt. McDonnell Douglas, now Boeing [the two companies merged in 1997], has even proposed a "stretched" C-17 as well as a tanker version, and has resolved range limitations by offering a modification, which adds a fuel tank in the center wing structure.

It might also behoove the air mobility community to be a bit more proactive by initiating ongoing research and development for all kinds of items as well as the systems on airlift and air refueling aircraft, developing, for instance, troop seats ahead of an aircraft acquisition program or standardizing the placement of switches to prevent inadvertent discharges. Having the flexibility to accommodate software growth remains unquestionable. Both the C-17 and the C-130J have faced this issue as new weapons systems. Recently, a need has emerged to meet the International Civil Aviation Organization's and the Federal Aviation Administration's air navigation requirements (Global Air Traffic Management), requiring the C-17 to plan for communication, navigation, and surveillance modifications.

While some aspects of the C-17's troubled acquisition were unforeseeable, others could have been better managed from inception. Quite simply, the ducks —make it airplanes —should have been lined up.

Editor's Note: The author welcomes questions or comments on this article. Contact her at **Betty.Kennedy@scott.af.mil**.

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DEPARTMENT OF DEFENSE

Under Secretary of Defense (Acquisition and Technology) (USD[A&T])
http://www.acq.osd.mil/
ACQWeb offers a library of USD(A&T) documents, a means to view streaming videos, and jump points to many other valuable sites.

Deputy Under Secretary of Defense (Acquisition Reform) (DUSD[AR])
http://www.acq.osd.mil/ar
AR news and events; reference library; DUSD(AR) organizational breakout; acquisition education and training policy and guidance.

Acquisition Systems Management
http://www.acq.osd.mil/api/asm/
Documentation, including Department of Defense Directives 5000.1 and 5000.2-R, Major Defense Acquisition Programs List, and more.

Director, Test, Systems Engineering & Evaluation (DTSE&E), USD(A&T)
http://www.acq.osd.mil/sa/se/index.htm
Systems engineering mission; Defense Acquisition Workforce Improvement Act information, training, and related sites; information on key areas of systems engineering responsibility.

Defense Acquisition Deskbook
http://www.deskbook.osd.mil
Automated acquisition reference tool covering mandatory and discretionary practices.

Defense Acquisition University (DAU) and Acquisition Reform Communications Center (ARCC)
http://www.acq.osd.mil/dau
DAU course and schedule information; consortium school links; documents, publications, and forms. ARCC provides acquisition reform training opportunities and materials.

Defense Acquisition University Virtual Campus
https://dau.fedworld.gov
Take DAU courses online at your desk, at home, at your convenience!

Army Acquisition Corps (AAC)
http://www.dacm.sarda.army.mil
News; policy; publications; personnel demo; contacts; training opportunities.

Army Acquisition
http://www.acqnet.sarda.army.mil
A-MART; documents library; training and business opportunities; past performance; paperless contracting; labor rates.

Navy Acquisition Reform
http://www.acq-ref.navy.mil/
Acquisition policy and guidance, World-Class Practices, the Acquisition Center of Excellence, and training opportunities.

Navy Acquisition, Research and Development Information Center
http://nardic.nrl.navy.mil
News and announcements; acronyms; publications and regulations; technical reports; "How to Do Business with the Navy," and much more!

Naval Sea Systems Command
http://www.navsea.navy.mil/sea017/toc.htm
Total Ownership Cost (TOC); documentation and policy; Reduction Plan; Implementation Timeline; TOC reporting templates; Frequently Asked Questions (FAQ).

Air Force (Acquisition)
http://www.safaq.hq.af.mil/
Policy; career development and training opportunities; reducing TOC; library; links.

Air Force Materiel Command (AFMC) Contracting Laboratory's Federal Acquisition Regulation (FAR) Site
http://farsite.hill.af.mil/
FAR search tool; *Commerce Business Daily* Announcements (CBDNet); *Federal Register*; Electronic Forms Library.

Defense Systems Management College (DSMC)
http://www.dsmc.dsm.mil
DSMC educational products and services; course schedules; *Program Manager* magazine and *Acquisition Review Quarterly* journal; job opportunities.

Defense Systems Management College Alumni Association (DSMCAA)
http://www.dsmcaa.org
Acquisition tools & resources, Government & related links, career opportunities, and member forums.

Defense Advanced Research Projects Agency (DARPA)
http://www.darpa.mil
News releases; current solicitations; "Doing Business with DARPA."

Defense Information Systems Agency (DISA)
http://www.disa.mil
Structure and mission of DISA; Defense Information System Network; Defense Message System; Global Command and Control System; much more!

National Imagery and Mapping Agency (NIMA) [Formerly Defense Mapping Agency (DMA)]
http://www.nima.mil
Imagery; maps and geodata; Freedom of Information Act resources; publications.

Defense Modeling and Simulation Office (DMSO)
http://www.dmso.mil
DoD Modeling and Simulation Master Plan; document library; events; services.

Defense Technical Information Center (DTIC)
http://www.dtic.mil/
Technical reports; products and services; registration with DTIC; special programs; acronyms; DTIC FAQs.

Joint Electronic Commerce Program Office (JECPO)
http://www.acq.osd.mil/ec/
Policy; newsletters; Central Contractor Registration; assistance centers; DoD Electronic Commerce Partners.

Open Systems Joint Task Force
http://www.acq.osd.mil/osjtf
Open Systems education and training opportunities; studies and assessments; projects, initiatives and plans; reference library.

Government Education and Training Network (GETN) (For Department of Defense Only)
http://atn.afit.af.mil/schedule_page.htm
Schedule of distance learning opportunities.

Government-Industry Data Exchange Program (GIDEP)
http://www.gidep.corona.navy.mil
Federally funded co-op of government and industry participants that provides an electronic forum to exchange technical information essential during research, design, development, production, and operational phases of the life cycle of systems, facilities, and equipment.

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FEDERAL CIVILIAN AGENCIES

ARNET (Joint Effort of the National Partnership for Reinventing Government and Office of Federal Procurement Policy)
http://www.arnet.gov/
Virtual library; federal acquisition and procurement opportunities; best practices; electronic forums; business opportunities; acquisition training; Excluded Parties List.

Federal Acquisition Institute (FAI)
http://www.faionline.com
Virtual campus for learning opportunities as well as information access and performance support.

Federal Acquisition Jump Station
http://nais.nasa.gov/fedproc/home.html
Procurement and acquisition servers by contracting activity; CBDNet; Reference Library.

Federal Aviation Administration (FAA)
http://www.asu.faa.gov
Online policy and guidance for all aspects of the acquisition process.

General Accounting Office (GAO)
http://www.gao.gov
Access to GAO reports, policy and guidance, and FAQs.

General Services Administration (GSA)
http://www.gsa.gov
Online shopping for commercial items to support government interests.

Library of Congress
http://www.loc.gov
Research services; Congress at Work; Copyright Office; FAQs.

National Partnership for Reinventing Government (NPR)
http://www.npr.gov/
NPR accomplishments and initiatives; "how to" tools; library.

National Technical Information Service (NTIS)
http://chaos.fedworld.gov/onow/
Online service for purchasing technical reports, computer products, videotapes, audiocassettes, and more!

Small Business Administration (SBA)
http://www.SBAonline.SBA.gov
Communications network for small businesses.

U.S. Coast Guard
http://www.uscg.mil
News and current events; services; points of contact; FAQs.

TOPICAL LISTINGS

MANPRINT
http://www.MANPRINT.army.mil
Points of contact for program managers; relevant regulations; policy letters from the Army Acquisition Executive; as well as briefings on the MANPRINT program.

DoD Acquisition Workforce Personnel Demonstration Project
http://www.crfpst.wpafb.af.mil/
Federal Register and Waivers Package; documents and briefings; reference material; operating procedures; FAQs.

DoD Specifications and Standards Home Page
http://www.dsp.dla.mil
All about DoD standardization; key Points of Contact; FAQs; Military Specifications and Standards Reform; newsletters; training; nongovernment standards; links to related sites.

Joint Advanced Distributed Simulation (JADS) Joint Test Force
http://www.jads.abq.com
JADS is a one-stop shop for complete information on distributed simulation and its applicability to test and evaluation and acquisition.

Risk Management
http://www.acq.osd.mil/sa/se/risk_management/index.htm
Risk policies and procedures; risk tools and products; events and ongoing efforts; related papers, speeches, publications, and Web sites.

Earned Value Management
http://www.acq.osd.mil/pm
Implementation of Earned Value Management; latest policy changes; standards; international developments; active noteboard.

Fedworld Information
http://www.fedworld.gov
Comprehensive central access point for searching, locating, ordering, and acquiring government and business information.

GSA Federal Service Supply
http://pub.fss.gsa.gov
The No. 1 resource for the latest services and products industry has to offer.

INDUSTRY AND PROFESSIONAL ORGANIZATIONS

Commerce Business Daily
http://www.govcon.com/
Access to current and back issues with search capabilities; business opportunities; interactive yellow pages.

Electronic Industries Alliance (EIA)
http://www.eia.org
Government Relations Department; includes links to issue councils; market research assistance.

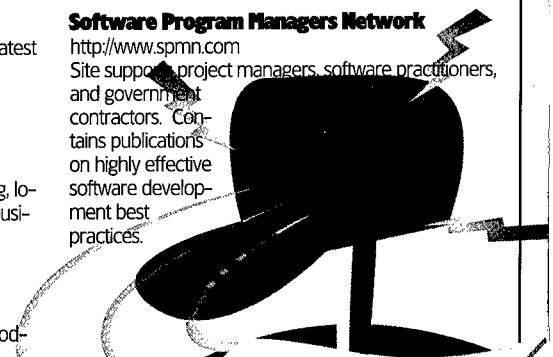
National Contract Management Association (NCMA)
http://www.ncmahq.org
"What's New in Contracting?"; educational products catalog; career center.

National Defense Industrial Association (NDIA)
http://www.ndia.org
Association news; events; government policy; *National Defense* Magazine.

International Society of Logistics
http://www.sole.org/
Online desk references that link to logistics problem-solving advice; Certified Professional Logistician certification.

Computer Assisted Technology Transfer (CATT) Program
http://catt.bus.okstate.edu
Collaborative effort between government, industry, and academia. Learn about CATT and how to participate.

Software Program Managers Network
http://www.spmn.com
Site supports project managers, software practitioners, and government contractors. Contains publications on highly effective software development best practices.



If you would like to add your acquisition or acquisition reform-related Web site to this list, please call the Acquisition Reform Communications Center (ARCC) at 1-888-747-ARCC. DAU encourages the reciprocal linking of its Home Page to other interested agencies. Contact the DAU Webmaster at:
dau_webmaster@acq.osd.mil

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